Rosemount 2230

Graphical Field Display

FOUNDATION

ROSEMOUNT®
Tank Gauging

www.rosemount-tg.com

EMERSON
Process Management

Rosemount 2230

Graphical Field Display

NOTICE
Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product. For equipment service or support needs, contact your local Emerson Process Management/Rosemount Tank Gauging representative. **Spare Parts** Any substitution of non-recognized spare parts may jeopardize safety. Repair, e.g. substitution of components etc, may also jeopardize safety and is under no circumstances allowed. Rosemount Tank Radar AB will not take any responsibility for faults, accidents, etc caused by non-recognized spare parts or any repair which is not made by Rosemount Tank Radar AB.

Cover Photo: 2230_coverphoto_2.jpg

Table of Contents

Section 1   Introduction

1.1   SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the safety messages listed at the beginning of each section before performing an operation preceded by this symbol.

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Explosions could result in death or serious injury:

- Verify that the operating environment of the transmitter is consistent with the appropriate hazardous locations certifications.

- Before connecting a hand held communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

- Do not remove the cover in explosive atmospheres when the circuit is alive.

- Substitution of components may impair Intrinsic Safety.

- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

⚠WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair, e.g. substitution of components etc., may also jeopardize safety and is under no circumstances allowed.

ROSEMOUNT®
Tank Gauging

EMERSON
Process Management

1.2 SYMBOLS

$C\epsilon$ The CE marking symbolizes the conformity of the product with the applicable European Community Directives.

<Ex>   The EC-Type Examination Certificate is a statement of a Notified Certification Body declaring that this product meets the Essential Health and Safety Requirements of the ATEX directive.

FM APPROVED   The FM APPROVED Mark indicates that the equipment is approved by FM Approvals according to applicable Approval Standards and is applicable for installation in hazardous locations.

Protective Earth.

Ground.

7 5   C   External cabling must be approved for use in min. 75°C.

1.3 MANUAL OVERVIEW

Section 1:Introduction
- Manual overview
- Product recycling/disposal
- Packing material

Section 2: Overview
- Introduction
- 2230 Components
- System Overview
- Getting started
- Installation Procedure

Section 3: Installation
- Mounting considerations
- Mechanical installation
- Electrical installation
- LED signals and Reset button
- Switches

Section 4: Configuration
- Menu tree
- Select View menu
- Options menu
- Service menu

Section 5: Service and troubleshooting
- Service
- Troubleshooting

Appendix A: Reference data
- Specifications
- Dimensional Drawings
- Ordering Information

Appendix B: Product certifications
- EU Conformity
- FM US Approvals
- FM Canadian Approvals
- European ATEX Directive Information
- IECEx Approval

1.4 TECHNICAL DOCUMENTATION

The Raptor System includes the following documents:

- Raptor Technical Description (704010EN)
- Rosemount 5900S Reference Manual (300520EN)
- Rosemount 2410 Reference Manual (300530EN)
- Rosemount 2240S Reference Manual (300550EN)
- Rosemount 2230 Reference Manual (300560EN)
- Raptor System Configuration Manual (300510EN)
- Rosemount 5300 Product Data Sheet (00813-0100-4530)
- Rosemount 5400 Product Data Sheet (00813-0100-4026)
- Rosemount 5300 Series Reference Manual (00809-0100-4530)
- Rosemount 5400 Series Reference Manual (00809-0100-4026)
- Rosemount TankMaster WinOpi Reference Manual (303028EN)
- Rosemount Raptor Installation Drawings

1.5 PRODUCT RECYCLING/ DISPOSAL

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

The label below is put on Rosemount Tank Gauging products as a recommendation to customers if scrapping is considered.

Recycling or disposal should be done following instructions for correct separation of materials when breaking up the units.

Figure 1-1. A green label is placed on the housing of the level gauge

1.6 PACKING MATERIAL

Rosemount Tank Radar AB is fully certified according to ISO 14001 environmental standards. By recycling the corrugated paperboard, or wooden boxes, used for shipping our products you can contribute to take care of the environment.

1.6.1 Reuse and Recycling

Experience has shown that wooden boxes can be used several times for various purposes. After careful disassembly the wooden parts may be reused. Metal waste may be converted.

1.6.2 Energy recovery

Products which have served their time may be divided into wood and metal components and the wood can be used as fuel in sufficient ovens.

Due to its low moisture content (approximately 7%) this fuel has a higher calorific value than ordinary wood fuel (moisture content approximately 20%).

When burning interior plywood the nitrogen in the adhesives may increase emissions of nitrogen oxides to the air 3-4 times more than when burning bark and splinter.

NOTE!
Landfill is not a recycling option and should be avoided.

Section 2   Overview

2.1   INTRODUCTION

The *Rosemount 2230* Graphical Field Display presents inventory tank gauging data such as level, temperature, and pressure. The 2230 communicates with the Rosemount 2410 Tank Hub via the intrinsically safe 2-wire **Tankbus**[1].

A 2230 connected to the multiple tank version of the 2410 allows you to view data from several tanks. It is possible to configure presentation of measurement variables for each tank individually.

The four softkeys at the front of the 2230 allow you to navigate through the different menus and provides all tank data, directly on the field.

Data from a group of tanks is buffered by a 2160 Field Communication Unit (FCU), and is distributed via the Group Bus to a TankMaster PC, or a host system, whenever the FCU receives a request for data. In case no FCU is included in the system, the 2410 Tank Hub can communicate directly with the host computer.

Figure 2-1. System integration
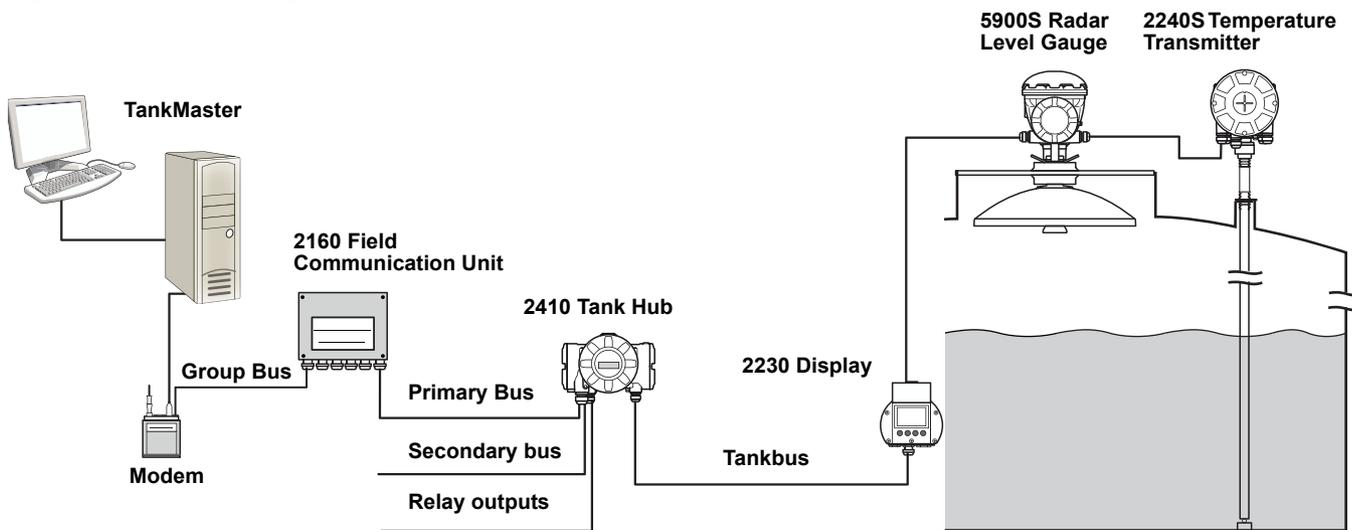
[1]   *The intrinsically safe Tankbus complies with the FISCO FOUNDATION™ fieldbus standard. See reference document IEC/TS 60079-27.*

2.2   2230 COMPONENTS

Figure 2-2. Rosemount 2230
components
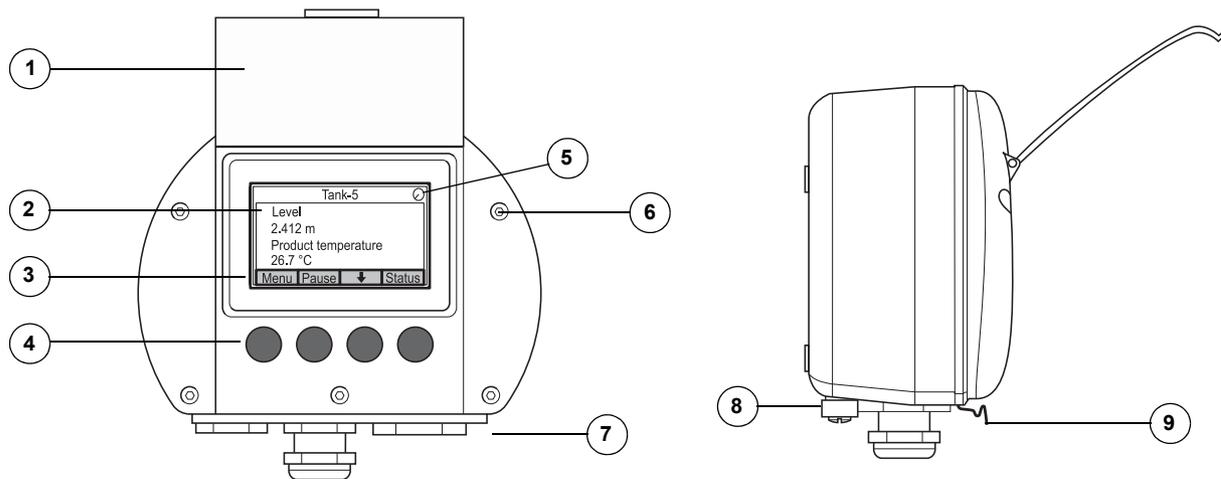
1. Weather protection lid[1]

2. Display

3. Menu

4. Soft keys

5. Activity indicator

6. Cover screw

7. Cable entries: two M20 x 1.5 and one M25 x 1.5
    (optional: ½ - 14 NPT and ¾ - 14 NPT adapters)

8. Ground screw

9. Locking spring for weather protection

(1)   It is recommended that the lid is closed whenever possible to protect the LCD from exposure
      by ultraviolet radiation from the sun.

2.3 SYSTEM OVERVIEW

Raptor is a state-of-the art inventory and custody transfer radar tank level gauging system. It is developed for a wide range of applications at refineries, tank farms and fuel depots, and fulfills the highest requirements on performance and safety.

The field devices on the tank communicate over the intrinsically safe *Tankbus*. The Tankbus is based on a standardized fieldbus, the FISCO[1] FOUNDATION™ fieldbus, and allows integration of any device supporting that protocol. By utilizing a bus powered 2-wire intrinsically safe fieldbus the power consumption is minimized. The standardized fieldbus also enables integration of other vendors' equipment on the tank.

The *Raptor* product portfolio includes a wide range of components to build small or large customized tank gauging systems. The system includes various devices, such as radar level gauges, temperature transmitters, and pressure transmitters for complete inventory control. Such systems are easily expanded thanks to the modular design.

Raptor is a versatile system that is compatible with and can emulate all major tank gauging systems. Moreover, the well-proven emulation capability enables step-by-step modernization of a tank farm, from level gauges to control room solutions.

It is possible to replace old mechanical or servo gauges with modern *Raptor* gauges, without replacing the control system or field cabling. It is further possible to replace old HMI/SCADA-systems and field communication devices without replacing the old gauges.

There is a distributed intelligence in the various system units which continuously collect and process measurement data and status information. When a request for information is received an immediate response is sent with updated information.

The flexible *Raptor* system supports several combinations to achieve redundancy, from control room to the different field devices. Redundant network configuration can be achieved at all levels by doubling each unit and using multiple control room work stations.

---

(1) *See documents IEC 61158-2 and IEC/TS 60079-27*

Figure 2-3. Raptor system
architecture
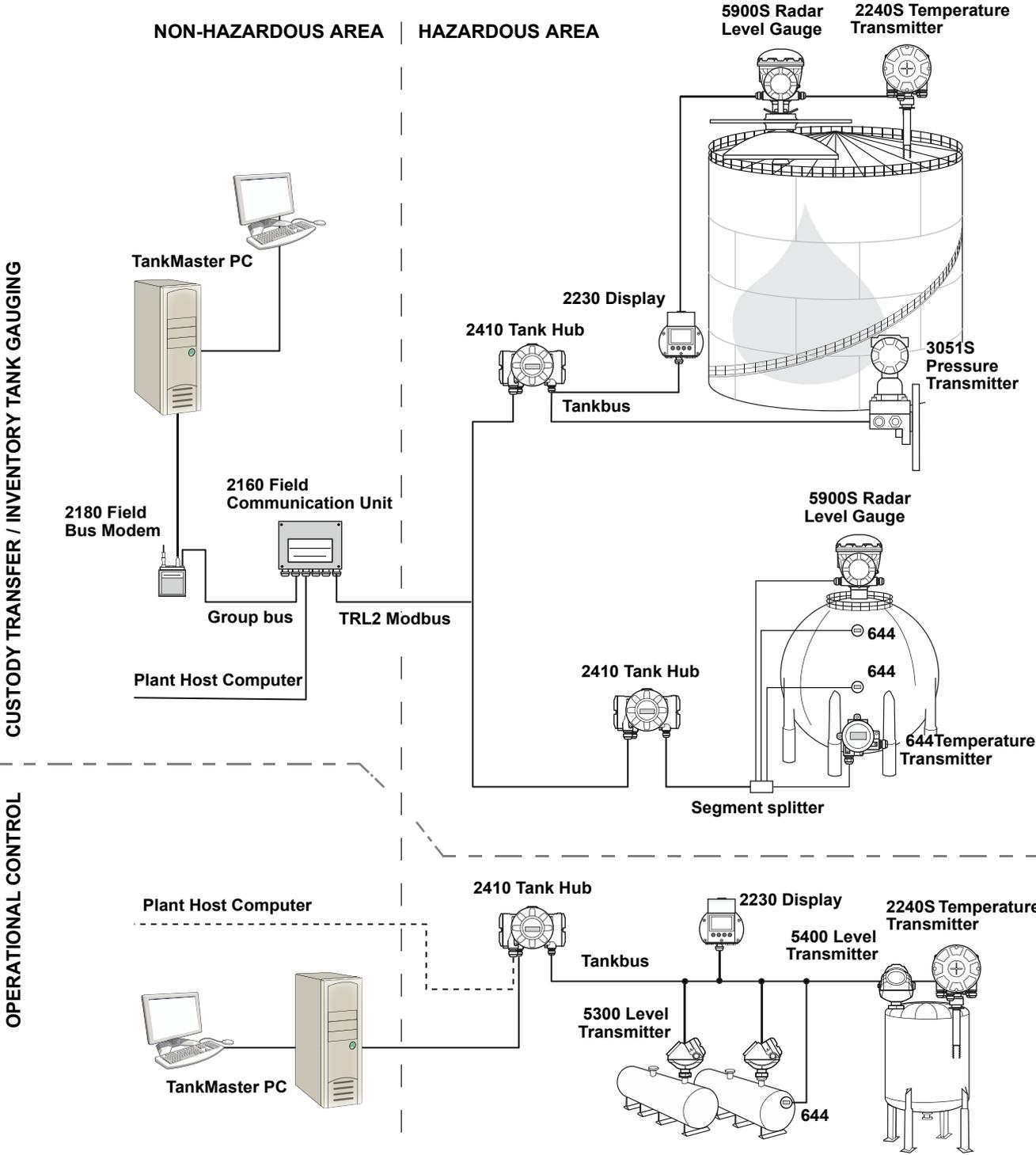
TankMaster HMI Software

TankMaster is a powerful Windows-based Human Machine Interface (HMI) for complete tank inventory management. It provides configuration, service, set-up, inventory, and custody transfer functions for *Raptor* systems and other supported instruments.

TankMaster is designed to be used in the Microsoft Windows XP and Vista environment providing easy access to measurement data from your Local Area Network.

The *TankMaster WinOpi* program lets the operator monitor measured tank data. It includes alarm handling, batch reports, automatic report handling, historical data sampling as well as inventory calculations such as Volume, Observed Density and other parameters. A plant host computer can be connected for further processing of data.

The *TankMaster WinSetup* program is a graphical user interface for installation, configuration and service of the different devices in the *Raptor* system.

Rosemount 2160 Field Communication Unit

The 2160 Field Communication Unit (FCU) is a data concentrator that continuously polls and stores data from field devices such as radar level gauges and temperature transmitters in a buffer memory. Whenever a request for data is received, the FCU can immediately send data from a group of tanks from the updated buffer memory.

Rosemount 2410 Tank Hub

The Rosemount 2410 Tank Hub acts as a power supply to the connected field devices in the hazardous area using the intrinsically safe Tankbus.

The 2410 collects measurement data and status information from field devices on a tank. It has two external buses for communication with various host systems. There are two versions of the 2410 for single tank or multiple tanks operation. The multiple tanks version supports up to 10 tanks and 16 devices.

The 2410 is equipped with two relays which support configuration of up to 10 "virtual" relay functions allowing you to specify several source signals for each relay.

Rosemount 5900S Radar Level Gauge

The *Rosemount 5900S* Radar Level Gauge is an intelligent instrument for measuring the product level inside a tank. Different antennas can be used in order to meet the requirements of different applications. The 5900S can measure the level of almost any product, including bitumen, crude oil, refined products, aggressive chemicals, LPG and LNG.

The *Rosemount 5900S* sends microwaves towards the surface of the product in the tank. The level is calculated based on the echo from the surface. No part of the 5900S is in actual contact with the product in the tank, and the antenna is the only part of the gauge that is exposed to the tank atmosphere.

The *2-in-1* version of the 5900S Radar Level Gauge has two radar modules in the same transmitter housing allowing two independent level measurements using one antenna.

Rosemount 5300 Guided Wave Radar

The Rosemount 5300 is a premium 2-wire guided wave radar for level measurements on liquids, to be used in a wide range of medium accuracy applications under various tank conditions. Rosemount 5300 includes the 5301 for liquid level measurements and the 5302 for liquid level and interface measurements.

Rosemount 5400 Radar Level Transmitter

The Rosemount 5400 is a reliable 2-wire non-contact radar level transmitter for liquids, to be used in a wide range of medium accuracy applications under various tank conditions.

Rosemount 2240S Multi-Input Temperature Transmitter

The *Rosemount 2240S* Multi-input Temperature Transmitter can connect up to 16 temperature spot sensors and an integrated water level sensor.

Rosemount 2230 Graphical Field Display

The *Rosemount 2230* Graphical Field Display presents inventory tank gauging data such as level, temperature, and pressure. The four softkeys allow you to navigate through the different menus to provide all tank data, directly in the field. The *Rosemount 2230* supports up to 10 tanks. Up to three 2230 displays can be used on the Tankbus.

Rosemount 644 Temperature Transmitter

The Rosemount 644 is used with single spot temperature sensors.

Rosemount 3051S Pressure Transmitter

The 3051S series consists of transmitters and flanges suitable for all kinds of applications, including crude oil tanks, pressurized tanks and tanks with / without floating roofs.

By using a 3051S Pressure Transmitter near the bottom of the tank as a complement to a 5900S Radar Level Gauge, the density of the product can be calculated and presented. One or more pressure transmitters with different scalings can be used on the same tank to measure vapor and liquid pressure

Rosemount 2180 Field Bus Modem

The Rosemount 2180 field bus modem (FBM) is used for connecting a TankMaster PC to the TRL2 communication bus. The 2180 is connected to the PC using either the RS232 or the USB interface.

See the *Raptor Technical Description* (Document no. 704010en) for more information on the various devices and options.

2.3.1 Raptor System Start-up

The standard start-up procedure of a Raptor system that includes devices such as the 2160 Field Communication Unit, 2410 Tank Hub, 5900S Radar Level Gauge, and the 2240S Multi-input Temperature Transmitter can be summarized in the following brief description:

1. Install the devices on the appropriate locations.

2. Assign Modbus addresses[1] for the Rosemount 2410 Tank Hub, level gauges such as the 5900S Radar Level Gauge, and auxiliary tank devices (ATD) such as the 2240S Multi-input Temperature Transmitter. The Modbus addresses will be stored in the built-in databases of the *Rosemount 2410 Tank Hub* and the *Rosemount 2160 Field Communication Unit*.

3. Verify that the total current consumption of devices connected to the Tankbus does not exceed 250 mA[2].

4. Wire the devices.

   - Connect field devices to the Tankbus.
     Note! Devices must be configured in the tank database[1][2] of the Rosemount 2410 Tank Hub in order to be able to communicate on the Tankbus.

   - Connect the Rosemount 2410 Tank Hub to the Rosemount 2160 Field Communication Unit.

   - Connect the Rosemount 2160 Field Communication Unit to the control room PC with TankMaster software. The 2160 may be connected via a Rosemount 2180 Field Bus Modem, or directly via RS 232 or RS 485.

5. Install the TankMaster software in the control room PC.

6. Configure the Raptor devices by using the TankMaster WinSetup configuration tool as described in the *Rosemount Raptor System Configuration Manual* (Document no. 300510EN).

See the reference manuals for other devices in the Raptor system for further information on installation and configuration.

---

(1) *See the Rosemount Raptor System Configuration Manual (Document no. 300510EN) for more information*

(2) *See the Rosemount 2410 Tank Hub Reference Manual, Document No. 300530EN for more information*

2.4 INSTALLATION PROCEDURE

Follow these steps for proper installation of the *Rosemount 2230* Graphical Field Display:

```
┌─────────────────────────────────────────┐
│ 1. Review installation considerations    │
│ ("Installation Considerations" on page 3-2) │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│ 2. Mount the 2230 in a suitable location │
│ ("Mounting the Graphical Display" on     │
│ page 3-3)                                 │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│ 3. Wire the 2230                          │
│ ("Electrical Installation" on page 3-6)   │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│ 4. Power up the 2230                      │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│ 5. Configure the 2230                     │
│ (Section 4: Configuration and Operation)  │
└─────────────────────────────────────────┘
```
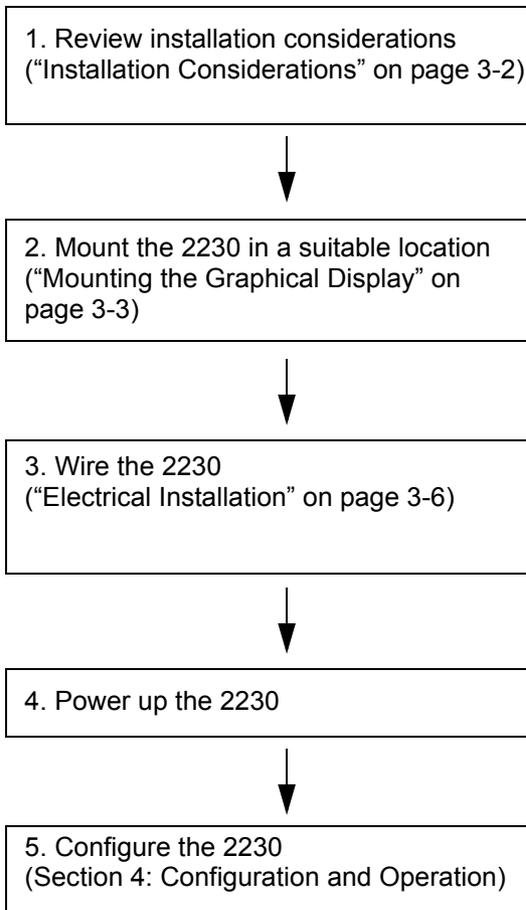
Section 3 Installation

3.1 SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

Substitution of components may impair Intrinsic Safety.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the display is consistent with the appropriate hazardous locations certifications.

Before connecting a hand held communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

⚠ WARNING

High voltage that may be present on leads could cause electrical shock:

Avoid contact with leads and terminals.

Make sure the main power to the Tank Hub is off and the lines to any other external power source are disconnected or not powered while wiring the device.

ROSEMOUNT®
Tank Gauging

EMERSON
Process Management

3.2 MECHANICAL INSTALLATION

3.2.1 Installation Considerations

The Rosemount 2230 Graphical Field Display can be installed either on the tank roof or at the foot of the tank for a flexible and convenient read-out of tank data.

The 2230 is designed for mounting on a plate, on a wall, or on a pipe. The display is attached to the plate with four M4 screws. It is important to provide space for opening the weather protection lid which prevents degradation of the LCD display due to sunlight exposure.

Consider the following when finding an appropriate location for the Rosemount 2230 Graphical Field Display:

- Mount the 2230 in a location where it is protected from excessive sun light. This will reduce exposure to ultra violet (UV) radiation and extend the life-time of the LCD.
- In case the 2230 can not be protected from sun light and UV radiation, it is recommended that the weather protection lid (see "2230 Components" on page 2-2) is closed whenever the 2230 is not used.
- An optional weather protection is available as an alternative method to protect the 2230.
- When mounting the 2230 display ensure that sufficient space is provided for opening the lid, see Figure 3-1.

Figure 3-1. Space required for opening the lid
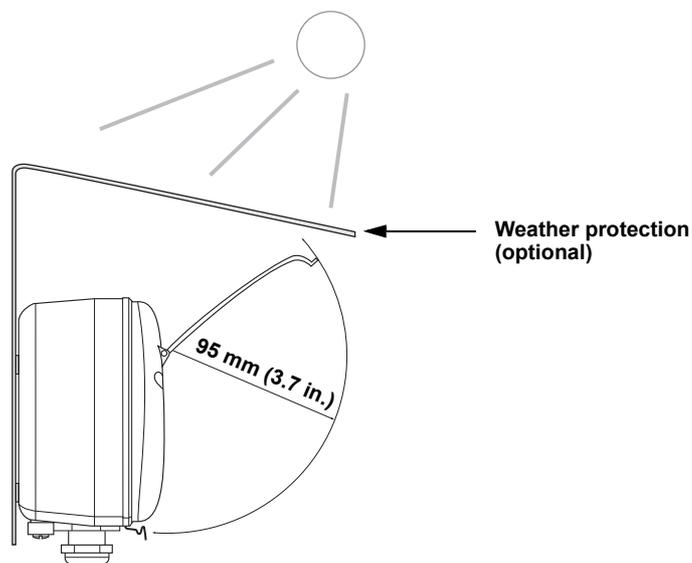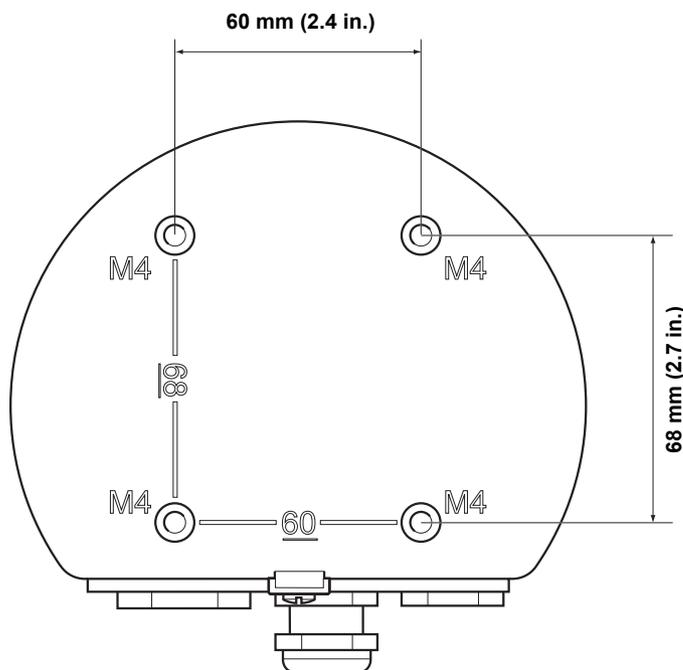
3.2.2 Mounting the Graphical Display

The Rosemount 2230 Graphical Field Display is designed for mounting on a plate, wall, or pipe.

Mounting on a Plate

The 2230 display can be mounted on a plate by attaching four M4 screws to the back of the display. To mount the 2230:
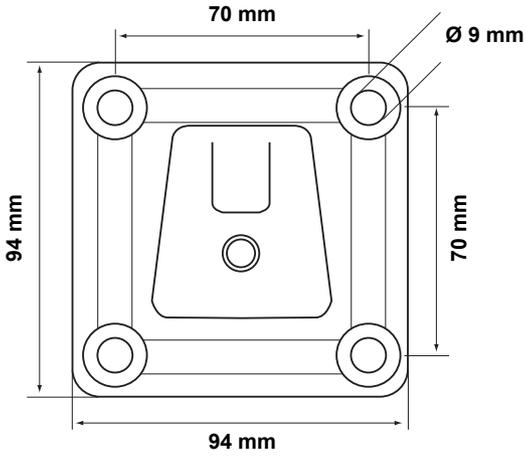
1. Drill four holes in the plate according to the hole pattern on the back of the 2230 display as illustrated in Figure 3-2.

2. Mount the 2230 on the plate using four M4 screws. Note that the M4 screws that are shipped with the 2230 display can be used as long as the plate thickness does not exceed 5 mm (0.2 in.).

Figure 3-2. Mounting hole pattern

Wall Mounting with Bracket

The Rosemount 2230 Graphical Field Display can be mounted on a wall by using the optional mounting kit supplied by Rosemount Tank Gauging.

	1. Mount the bracket on the wall by using four M8 screws and flat washers. **Note**! Countersunk screws are not suitable.
	2. Attach the mounting plate to the back of the 2230 housing. 3. Attach the 2230 display to the bracket on the wall and tighten the locking screw.
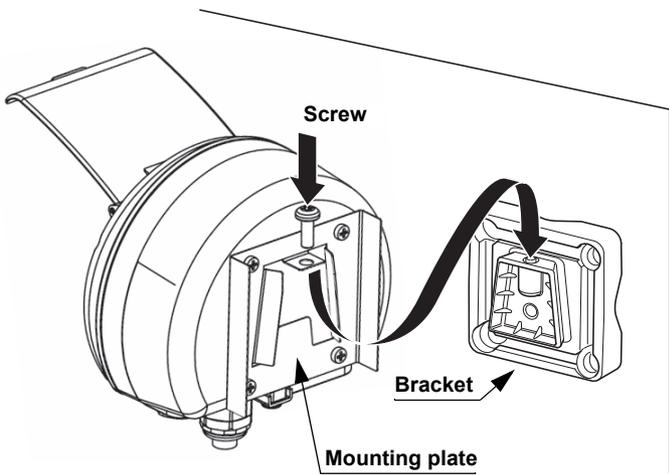
Pipe Mounting

The 2230 can be mounted on pipes ranging from diameter 33 to 60 mm by using an optional mounting kit supplied by Rosemount Tank Gauging.

4 nuts and washers x4 **Bracket**	1. Attach the bracket to the pipe. 2. Ensure that the 2230 is placed in a direction so that the display is clearly visible and wiring can be properly connected. 3. Tighten the nuts. Use moderate torque to ensure that the bracket does not break.
Bracket **Mounting plate**	4. Attach the mounting plate to the back of the 2230 housing. 5. Attach the 2230 to the bracket by sliding it from the top downwards.
Screw	6. Secure the 2230 to the bracket by tightening the locking screw.
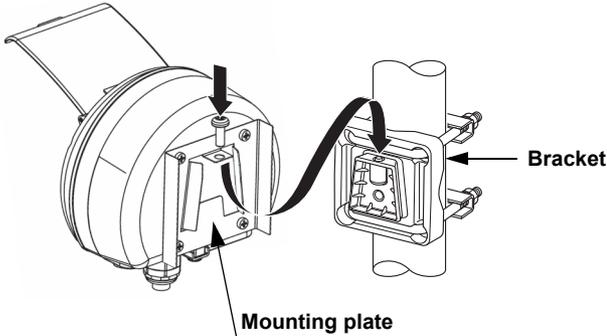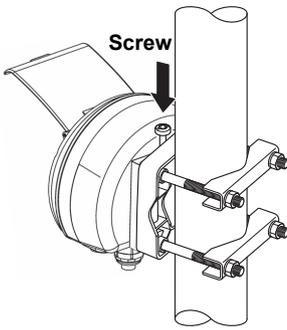
3.3 ELECTRICAL INSTALLATION

3.3.1 Cable/Conduit Entries

The electronics housing has three entries, two M20×1.5 and one M25×1.5 (Optional: adapters for two ½ - 14 NPT and one ¾- NPT). Minifast and eurofast adapters are also available. The connections are made in accordance with local or plant electrical codes.

Make sure that unused ports are properly sealed to prevent moisture or other contamination from entering the electronics housing.

NOTE!
Use a enclosed metal plug to seal the unused entry/entries. The plastic plugs mounted at delivery are not sufficient as seal!

3.3.2 Grounding

The housing should always be grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection to earth ground with minimal impedance.

There is an external grounding screw located at the bottom of the housing, see Figure 3-3, and an internal grounding screw located inside the housing, see Figure 3-5.

The internal ground screw is identified by a ground symbol: ⏚ .

Figure 3-3. Grounding screws
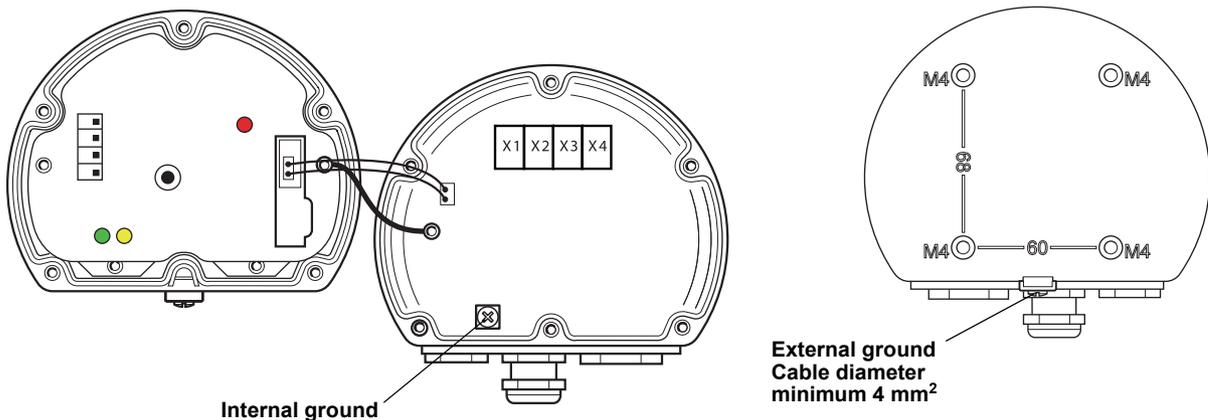
NOTE!
When grounding the display via threaded conduit, make sure the connection provides sufficient low impedance.

Grounding - FOUNDATION™ Fieldbus

Signal wiring of the fieldbus segment must not be grounded. Grounding one of the signal wires will shut down the entire fieldbus segment.

Shield Wire Connection

To protect the fieldbus segment from noise, grounding techniques for shield wire usually require a single grounding point for shield wire to avoid creating a ground loop. The ground point is typically at the power supply (Rosemount 2410 Tank Hub).

The Raptor devices are designed for "daisy-chain" connection of shield wiring in order to enable a continuous shield throughout the Tankbus network. The shield wire terminal in the 2230 is not connected to ground. It only provides electrical continuity to daisy-chained Tankbus cables.

3.3.3 Cable Selection for the Tankbus

Use shielded twisted pair wiring for the Rosemount 2230 in order to comply with FISCO[1] requirements and EMC regulations. The cables must be approved for use in hazardous areas, where applicable. In the U.S. explosion-proof conduits may be used in the vicinity of the vessel.

We recommend cable size 0.75 mm^2 (18 AWG) in order to facilitate wiring. However, cables within the range 22 AWG to 16 AWG (0.5 t o1.5 mm²) in order to minimize the voltage drop to the 2230 display.

Tankbus cabling must be approved for use in minimum 85°C to match requirements for all devices in a Raptor system.

The FISCO specification requires that cables for the Tankbus comply with the following parameters:

Table 3-1. FISCO cable parameters

Parameter	Value
Loop resistance	15Ω/km to 150Ω/km
Loop inductance	0.4 mH/km to 1 mH/km
Capacitance	45 nF/km to 200 nF/km
Maximum length of each spur cable	60 m in apparatus class IIC and IIB
Maximum length of each trunk cable	1000 m in apparatus class IIC and 1900 m in apparatus class IIB

3.3.4 Hazardous Areas

When the Rosemount 2230 is installed in a hazardous area, national and local regulations and specifications in applicable certificates must be observed, see Appendix B: Product Certifications.

3.3.5 Power Requirements

The Rosemount 2230 is powered over the intrinsically safe Tankbus by the Rosemount 2410 Tank Hub. The 2410 feeds the intrinsically safe fieldbus segment by acting as a FISCO power supply on the Tankbus (9 - 17.5 Vdc, polarity insensitive).

See the *Rosemount 2410 Reference Manual* (Document no. 305030EN) for more information.

---

(1)   *See IEC 61158-2 and IEC/TS 60079-27:2002.*

3.3.6   The Tankbus

The Raptor system is easy to install and wire. Devices can be "daisy-chained" thus reducing the number of segment couplers.

In a Raptor system devices communicate with a Rosemount 2410 Tank Hub via the intrinsically safe Tankbus. The Tankbus complies with the FISCO[1] FOUNDATION fieldbus standard. The Rosemount 2410 acts as power supply to the field devices on the Tankbus.

Termination

A terminator is needed at each end of a FOUNDATION Fieldbus network. Generally, one terminator is placed in the fieldbus power supply, and the other one in the last device in the fieldbus network.

NOTE!
Ensure that there are **two** terminators on the fieldbus.

In a Raptor system the Rosemount 2410 Tank Hub acts as power supply. Since the 2410 normally is the first device in the fieldbus segment, the built-in termination is enabled at factory.

Other Raptor devices such as the Rosemount 5900S Radar Level Gauge, the Rosemount 2230 Graphical Field Display, and the Rosemount 2240S Multi-input Temperature Transmitter also have built-in terminators which can easily be enabled by inserting a jumper in the terminal block when necessary.

Segment design

When designing a FISCO fieldbus segment a few requirements need to be considered. Cabling has to comply with FISCO requirements as described in "Cable Selection for the Tankbus" on page 3-7.

You will also have to ensure that the total operating current of the connected field devices is within the output capability of the Rosemount 2410 Tank Hub. The 2410 is able to deliver 250 mA. Consequently, the number of field devices has to be considered so that the total current consumption is less than 250 mA.

Another requirement is to ensure that all field devices have at least 9 V input voltage at their terminals. Therefore you will have to take into account the voltage drop in the fieldbus cables.

Distances are normally quite short between the Rosemount 2410 Tank Hub and field devices on the tank. In many cases you can use existing cables as long as the FISCO requirements are fulfilled (see "Cable Selection for the Tankbus" on page 3-7).

See "The Tankbus" in the *Rosemount 2410 Reference Manual* (Document no. 305030EN) for more information on segment design of a Raptor system.

---

(1)   FISCO=Fieldbus Intrinsically Safe Concept

3.3.7 Typical installations

The example below in Figure 3-4 illustrates a Raptor system with terminators at both ends of the fieldbus segment as required in a FOUNDATION fieldbus system. In this case terminators are enabled in the Rosemount 2410 Tank Hub and a Raptor field device at the end of the network segment.

Figure 3-4. Example of Tankbus connection for a single tank
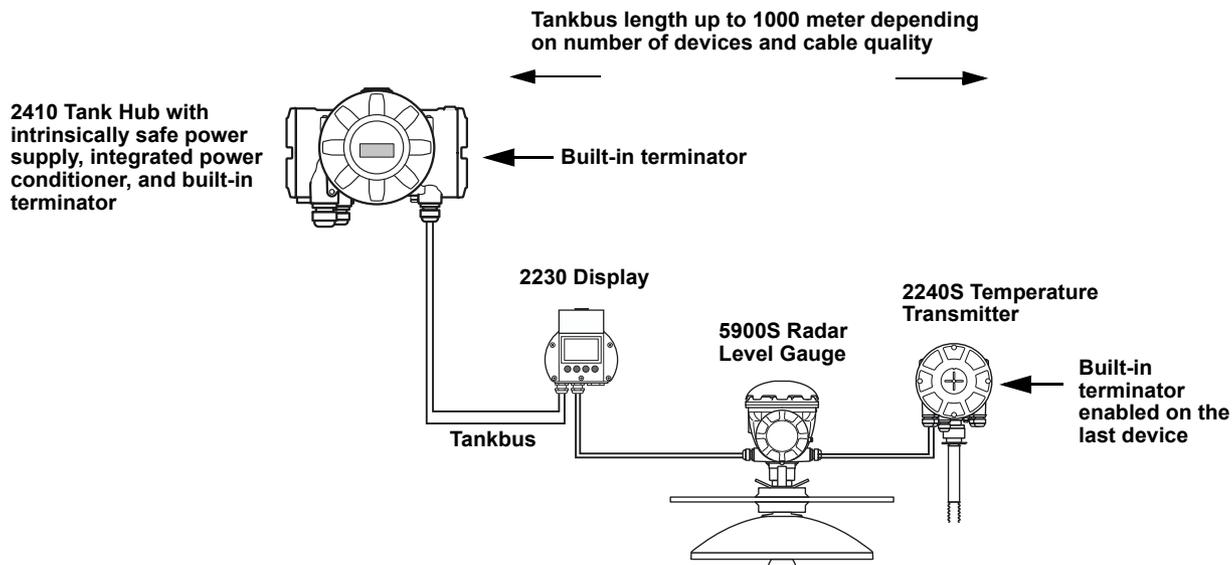
The maximum distance between the 2410 Tank Hub and the field devices on the tank depends on the number of devices connected to the Tankbus and the quality of cables.

See chapter "Electrical Installation" in the *Rosemount 2410 Reference Manual* (Document no. 305030EN) for more information about cable selection, power budget, and the Raptor Tankbus.

See also "Typical Installations" in the *Rosemount 2410 Reference Manual* (Document no. 305030EN) for more examples of Raptor system installations.

3.3.8   Wiring

Use the following wiring procedure for the Rosemount 2230:

1. Unscrew and remove all six screws at the front of the display.

2. Remove the cover carefully. Take care of the locking spring for the weather protection hatch, see "2230 Components" on page 2-2.

NOTE!
Do not disconnect the cables between the display front and the circuit board. Ensure that the compartment is protected against water in case of rain.

---

3. Run the Tankbus cable through the gland.

4. Connect the Tankbus wires to the **X2** and **X3** terminals as illustrated in Figure 3-5 on page 3-11. Ensure that the positive lead is connected to the terminal marked **FB+** and the negative lead to the terminal marked **FB-**.

5. Connect the cable shield to the "Shield Loop Through" (X1) terminal.

6. If the 2230 display is the last device on the Tankbus, connect a jumper for the built-in termination. See "The Tankbus" on page 3-8 for more information on termination.

7. Replace the cover. Make sure that the sealing and the locking device for the weather protection hatch are placed in the correct positions.

8. Firmly tighten the six screws on the front cover.

NOTE!
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. The same requirements apply for cable inlets and outlets (or plugs). Cables must be properly attached to the cable glands.

Section 3. Installation

Figure 3-5. 2230 cable
connections

X2: Tankbus (+) output

X3: Tankbus (-) output

**Daisy-chain
connection to other
field devices
(see page 3-12)**

Front cover

Sealing

Cable Shield

**Jumper for
built-in
termination**

**X4: Tankbus
terminator**

X1 X2 X3 X4

FB+ FB-

Internal grounding

X2: Tankbus FB+ input

X3: Tankbus FB- input

Daisy-Chain Connection

You may use the daisy-chain option in order to connect the Rosemount 2230 to other field devices on the Raptor Tankbus:

1. Unscrew and remove all six screws on the front of the Rosemount 2230. Remove the cover carefully. Take care of the locking device for the weather protection hatch.

NOTE!
Do not disconnect the cables between the display front and the circuit board.

2. Disconnect the termination jumper from the X3 terminal, see Figure 3-5 on page 3-11.

3. Run the new Tankbus cable into the 2230 compartment through a suitable gland.

4. Connect the outgoing Tankbus wires to the X2-out and X3-out terminals as shown in Figure 3-6.

Figure 3-6. Daisy-chain wiring
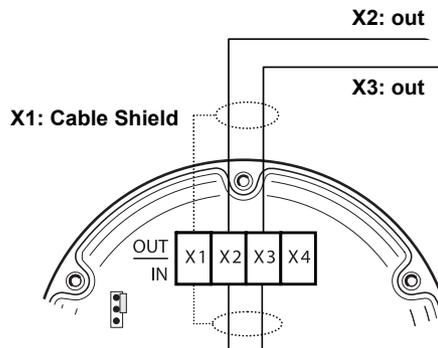
5. Connect the cable shield to the X1 terminal.

6. Replace the cover. Make sure the sealing and the locking device for the weather protection hatch are placed in the correct positions.
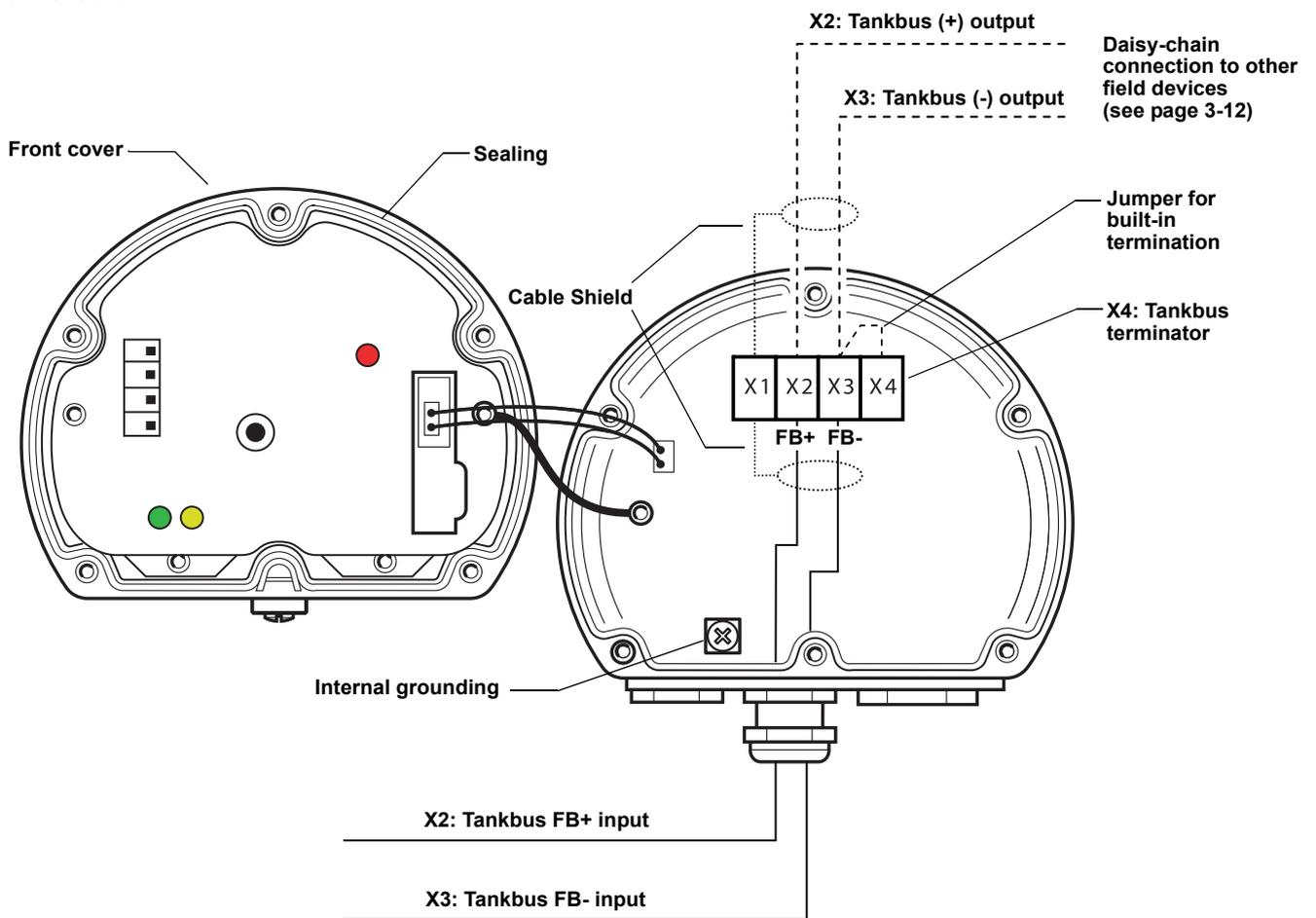
7. Firmly tighten the six screws on the front cover.

Figure 3-7. Wiring diagram for Rosemount 2230

As illustrated in Figure 3-7 the Rosemount 2230 can be daisy-chained to other field devices via the Tankbus.

3.4 LED SIGNALS AND RESET BUTTON

The Rosemount 2230 has three LED signals that show communication and status.

Figure 3-8. LED Signals
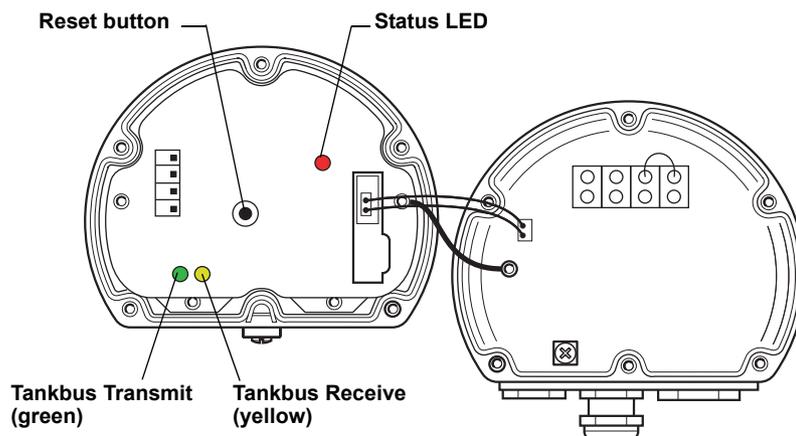
Status LED

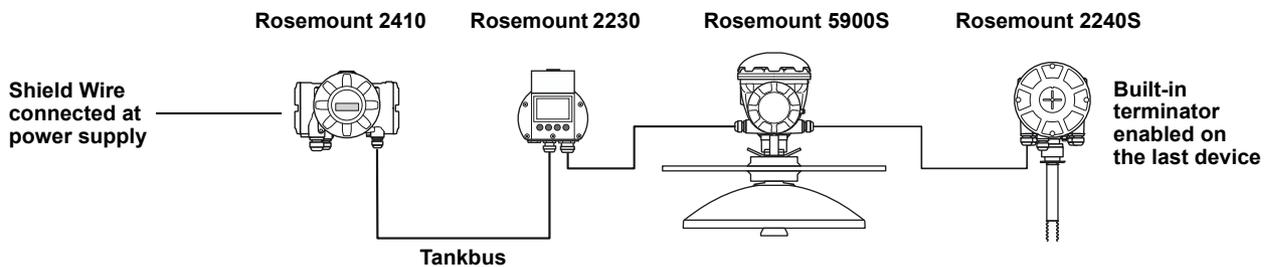Using different blinking sequences, the status LED indicates error codes. In normal operation the LED flashes every other second. When an error occurs, the LED flashes a sequence that corresponds to a code number followed by a five second pause. This sequence is continuously repeated (for more information see "Device Error Signals" on page 5-6).

Communication LED:s

Tankbus communication is indicated by a pair of LED:s, see Figure 3-8. When you connect the Tankbus cables you can check the communication status with the LED:s.

Reset Button

You may use the Reset button to force a restart of the Rosemount 2230 display. Restarting the 2230 has the same effect as switching off and on the power supply.

The Restart option will connect the Rosemount 2230 display to the Rosemount 2410 Tank Hub and perform start-up tests of software and hardware.

3.5   SWITCHES

3.5.1   DIP Switches

The Rosemount 2230 is equipped with four DIP switches as illustrated in Figure 3-9.

Figure 3-9. DIP Switches
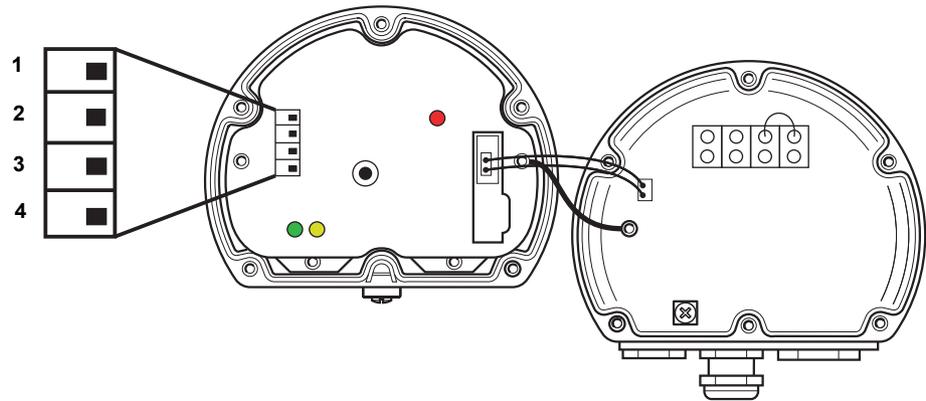
The switches control the following settings:

Table 3-2. Rosemount 2230 DIP Switches

Number	Name	Description
1	**Simulate**	Enables simulation for test of 2230 in open FF systems.
2	**Write Protect**	Enables write protection of configuration data.
3	**Spare**	Not used
4	**Spare**	Not used

NOTE!
Manual configuration may override the switch setting.

The Simulate Switch

The Simulate switch is used to simulate measurement values from the tanks. The switch returns from "ON" to "OFF" after power is applied. This feature prevents the transmitter from being left in simulation mode.

Write Protect Switch

The Write Protect switch can be used to protect the Rosemount 2230 from unintentional changes of the current configuration.

3.6   AMBIENT TEMPERATURE

The Rosemount 2230 is equipped with a temperature sensor for measuring ambient temperature. The temperature can be displayed on the field display and in the TankMaster software.

Section 4 Configuration and Operation

4.1 SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

⚠WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the display is consistent with the appropriate hazardous locations certifications.

Before connecting a hand held communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

ROSEMOUNT®
Tank Gauging

EMERSON
Process Management

4.2 INTRODUCTION

This chapter provides information about configuration and operation of the *Rosemount 2230* Graphical Field Display.

For information on how to use TankMaster WinSetup to configure the 2230, see the *Raptor System Configuration Manual (Document no.300510EN)*.

4.2.1 The 2230 Graphical Field Display

The *Rosemount 2230* is a graphical display designed for viewing tank data in tough environments. It features adjustable LCD contrast, backlight, multi-language support, and communication failure indication.

The four softkeys allow you to navigate through the different menus and to select various functions for tank data viewing and service.

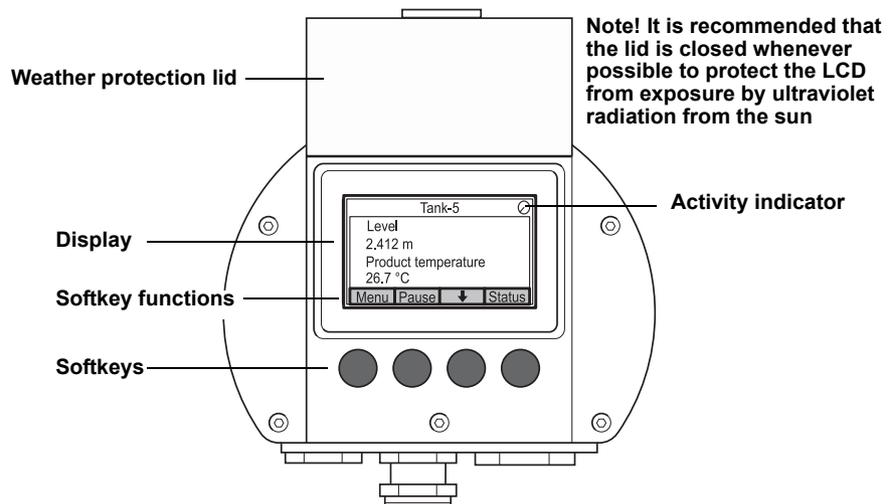**Menu**: opens the Main Menu with various options for configuration of the 2230 display.

Pause: stops toggling the measurement variables until the Resume button is pressed.

Down arrow: lets you scroll through the list of measurement variables and tanks.

Status: lets you view the current status of the presented measurement variable. See also "Status Information" on page 5-11.

A symbol in the upper right-hand corner of the display indicates that the 2230 is operating and communicates on the Tankbus.

Figure 4-1. The Rosemount 2230 display

Weather protection lid

Note! It is recommended that the lid is closed whenever possible to protect the LCD from exposure by ultraviolet radiation from the sun

Activity indicator

Display

Tank-5
Level
2.412 m
Product temperature
26.7 °C
Menu | Pause | ↓ | Status

Softkey functions

Softkeys

The *Rosemount 2230* is powered by the Tankbus (see "Power Requirements" on page 3-7).

Adjusting the display contrast

The 2230 automatically adjusts display contrast to optimize for changes of ambient temperature. The contrast can be manually adjusted when further fine-tuning is desired. To increase the display contrast, press the two buttons on the right-hand side simultaneously. To decrease the contrast, press the two buttons on the left-hand side. It takes approximately 10 seconds to adjust from minimum to maximum contrast.

The contrast can also be adjusted by using the Contrast service command: <Menu><Service><LCD Contrast>.

4.2.2 Activity and Alarm Indication

The *Rosemount 2230* display shows a warning symbol for simulated or manual measurement values as illustrated in Figure 4-2 and Figure 4-3.

Figure 4-2. Simulated or manual value

Manual or simulated measurement values are indicated by an alarm symbol as shown in Figure 4-2.

```
┌─────────────────────────────┐
│     Tank-5              ◷    │
│  Level                      │
│  2.412 m                    │
│ ⚠ Liquid temperature        │
│  26.7 °C                    │
│ Menu │ Pause │  ↓  │ Status │
└─────────────────────────────┘
```
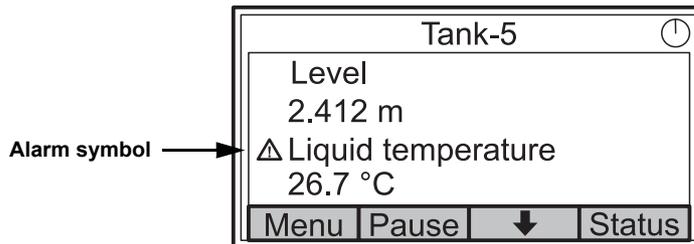**Alarm symbol** ─────→

Figure 4-3. Invalid value

For invalid measurement data, the alarm symbol is displayed and no data appears in the measurement value field as illustrated in Figure 4-3.

```
┌─────────────────────────────┐
│     Tank-5              ◷    │
│  Level                      │
│  2.412 m                    │
│ ⚠ Liquid temperature        │
│  ▬▬.▬▬▬.                     │
│ Menu │ Pause │  ↓  │ Status │
└─────────────────────────────┘
```
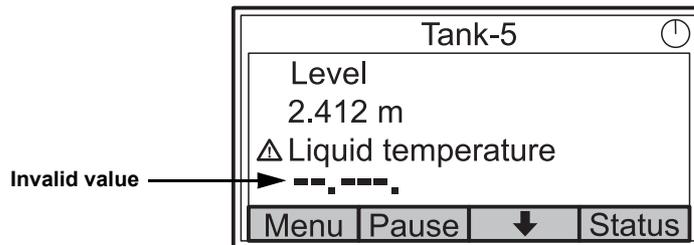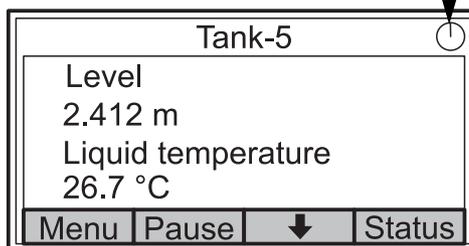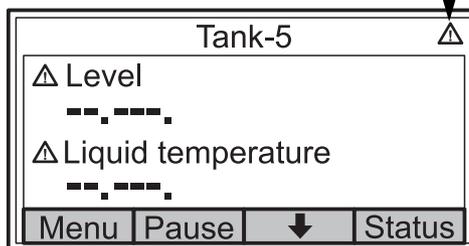**Invalid value** ─────→

Figure 4-4. Activity indicator

The activity indicator spins continuously to indicate that the 2230 is operating normally. In case of a communication problem an alarm symbol is displayed instead.

Activity indicator for normal operation ─────────────┐

```
┌─────────────────────────────┐
│     Tank-5              ◷    │
│  Level                      │
│  2.412 m                    │
│  Liquid temperature         │
│  26.7 °C                    │
│ Menu │ Pause │  ↓  │ Status │
└─────────────────────────────┘
```

Communication problems ─────────────┐

```
┌─────────────────────────────┐
│     Tank-5              ⚠    │
│ ⚠ Level                     │
│  ▬▬.▬▬▬.                     │
│ ⚠ Liquid temperature        │
│  ▬▬.▬▬▬.                     │
│ Menu │ Pause │  ↓  │ Status │
└─────────────────────────────┘
```
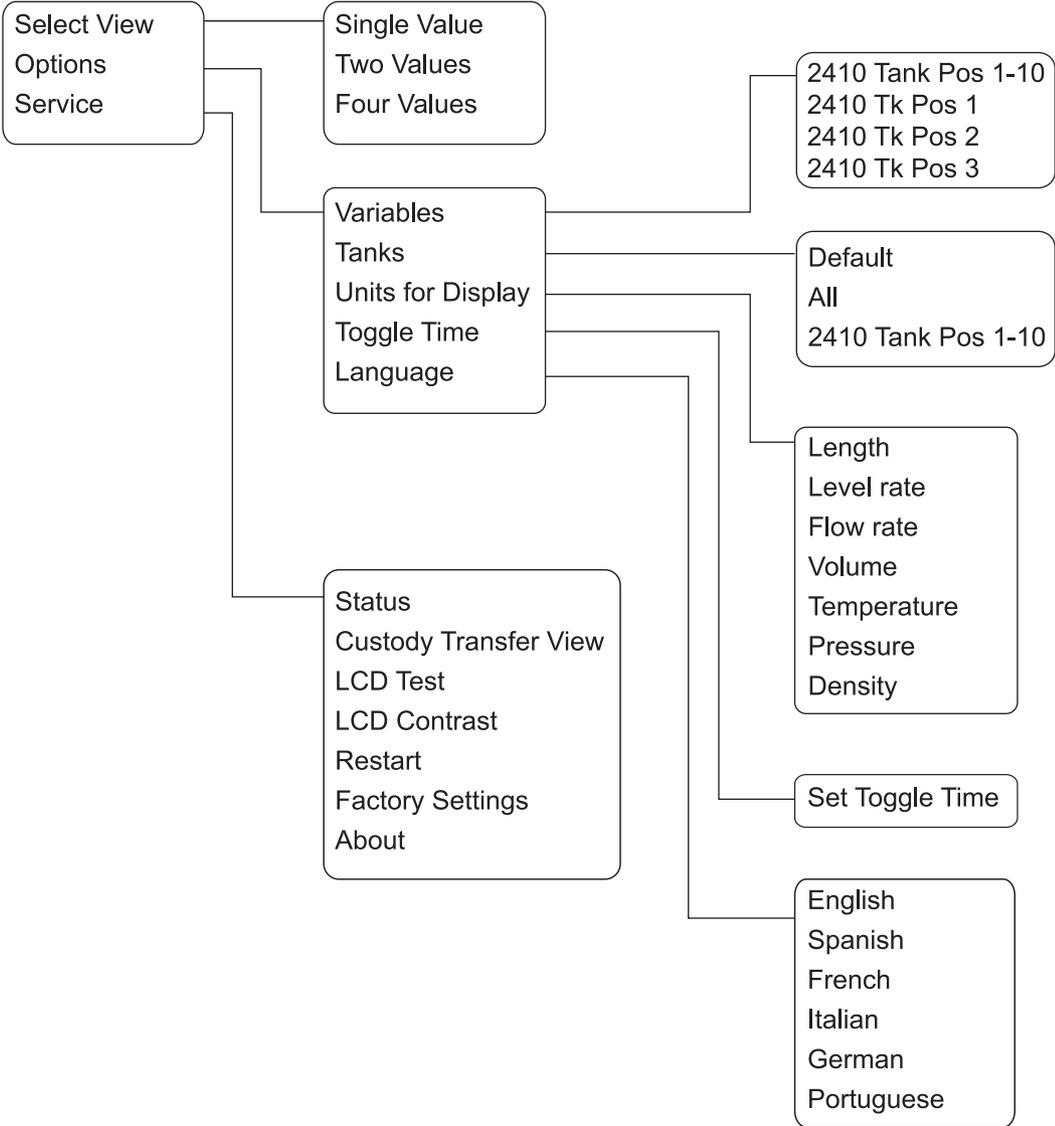
4.3 MENU TREE

The *Rosemount 2230* lets you navigate in a menu structure as illustrated in Figure 4-5:
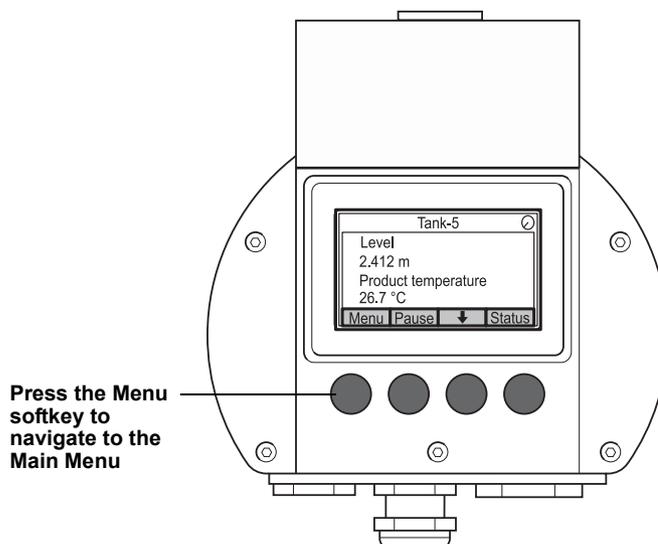
Figure 4-5. Rosemount 2230
Menu Tree

4.4   THE MAIN MENU

In normal operation the *Rosemount 2230* display is in View Mode and shows the current measurement values for the selected tanks. In case of an alarm, a graphical symbol appears on the screen.

Figure 4-6. Rosemount 2230 Graphical Field Display in View Mode

To navigate from View Mode to the Main Menu, press the **Menu** softkey on the left-hand side.

Figure 4-7. The Main menu
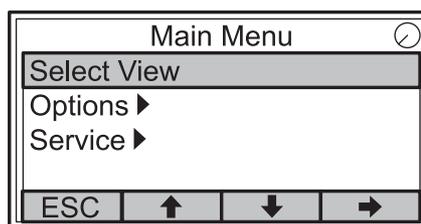
The Main Menu includes the following options:

Select View which lets you select the preferred view, see section "The Select View Menu" on page 4-6.

Options which lets you select variables and tanks to display, as well as measurement units, toggle time, and language. See section "The Options Menu" on page 4-7.
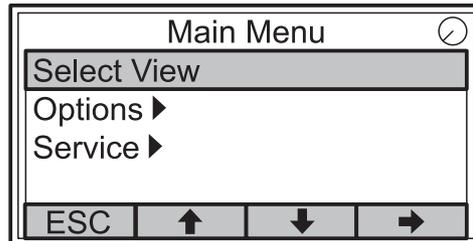
Service which includes the functions Status, Custody Transfer View, LCD Test, Restart, and Factory Settings. It also includes the About option which shows the current software version. See section "The Service Menu" on page 4-14.

4.5 THE SELECT VIEW MENU

In the Select View menu, you can specify the number of measurement values to be displayed in View Mode. To configure the Select View menu:
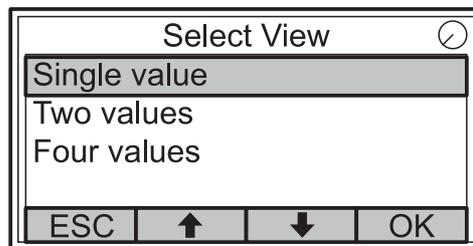
1. In View Mode, press the <Menu> button to navigate to the Main menu.

Figure 4-8. The Main menu

```
┌─────────────────────────────────┐
│        Main Menu          ⊘      │
│ ┌─────────────────────────────┐ │
│ │ Select View                 │ │
│ └─────────────────────────────┘ │
│  Options ▶                       │
│  Service ▶                       │
│ ┌──────┬──────┬──────┬────────┐ │
│ │ ESC  │  ↑   │  ↓   │   ➡    │ │
│ └──────┴──────┴──────┴────────┘ │
└─────────────────────────────────┘
```

2. Highlight the **Select View** menu item using the ↑ and ↓ softkeys.
3. Press the ➡ softkey.

Figure 4-9. The Select View menu

```
┌─────────────────────────────────┐
│        Select View        ⊘      │
│ ┌─────────────────────────────┐ │
│ │ Single value                │ │
│ └─────────────────────────────┘ │
│  Two values                      │
│  Four values                     │
│ ┌──────┬──────┬──────┬────────┐ │
│ │ ESC  │  ↑   │  ↓   │  OK    │ │
│ └──────┴──────┴──────┴────────┘ │
└─────────────────────────────────┘
```
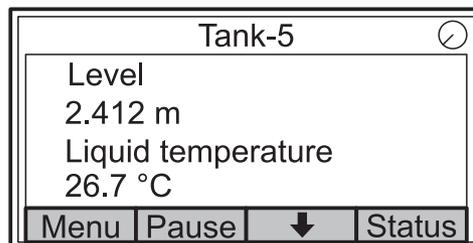
4. In the Select View Menu, use the up and down arrow softkeys to navigate to the desired option.
5. Press the <OK> softkey to select the desired option. The Rosemount 2230 returns to View Mode.

For example, using the Two Values option will present a view as illustrated in Figure 4-10:

Figure 4-10. Example of display configuration with Two values

```
┌─────────────────────────────────┐
│          Tank-5           ⊘      │
│ ┌─────────────────────────────┐ │
│ │  Level                      │ │
│ │  2.412 m                    │ │
│ │  Liquid temperature         │ │
│ │  26.7 °C                    │ │
│ ├──────┬────────┬─────┬───────┤ │
│ │ Menu │ Pause  │  ↓  │Status │ │
│ └──────┴────────┴─────┴───────┘ │
└─────────────────────────────────┘
```
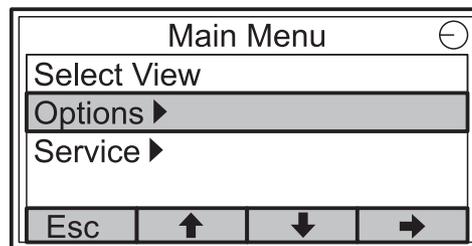
4.6 THE OPTIONS MENU

In the Options Menu, the following items are available:

- Variables
- Tanks
- Units for Display
- Toggle Time
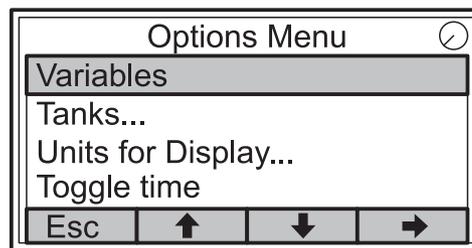- Language

To choose an item in the Options menu:

1. In View Mode, press the <Menu> button to open the Main menu:

Figure 4-11. The Main menu

```
┌─────────────────────────────┐
│    Main Menu          ⊖     │
│ ┌─────────────────────────┐ │
│ │ Select View             │ │
│ ├─────────────────────────┤ │
│ │ Options ▶               │ │
│ ├─────────────────────────┤ │
│ │ Service ▶               │ │
│ └─────────────────────────┘ │
│  Esc  │  ↑  │  ↓  │  ➡      │
└─────────────────────────────┘
```

2. Highlight the **Options** menu item by using the ↑ and ↓ softkeys.
3. Press the ➡ softkey.

Figure 4-12. The Options menu

```
┌─────────────────────────────┐
│    Options Menu       ⊘     │
│ ┌─────────────────────────┐ │
│ │ Variables               │ │
│ └─────────────────────────┘ │
│  Tanks...                   │
│  Units for Display...       │
│  Toggle time                │
│  Esc  │  ↑  │  ↓  │  ➡      │
└─────────────────────────────┘
```

4. In the Options Menu, use the up and down arrow softkeys to navigate to the desired menu item.
5. Press the ➡ softkey to continue to the selected menu.

4.6.1 Variables

In the Select Variables menu, you can choose which variables to present in View Mode. The following options are available:

- **2410 Tank Pos 1-10** lets you configure a common set of variables to be presented for all tanks
- **2410 Tk Pos 1, 2, 3...** lets you configure variables individually for each tank

For a list of available variables see Table 4-1 on page 4-9.

Select Variables Menu

The Select Variables menu allows you to select variables to be displayed in View Mode. Option "2410 Tank Pos 1-10" can be used to specify a common set of variables to be used for all tanks connected to the same 2410 Tank Hub. In addition to this you can configure tanks individually by specifying a unique set of variables for each tank. Note that the individual configuration will be added to the configuration that is common for all tanks.

For a list of selectable variables, see Table 4-1 on page 4-9.
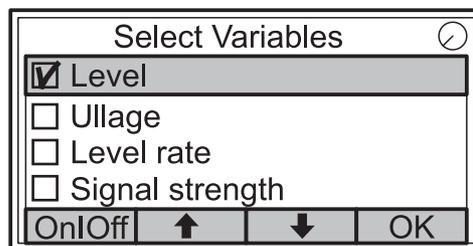
To select variables:

1. In View Mode, press <Menu> <Options> <Variables>.

Figure 4-13. The Select Variables menu
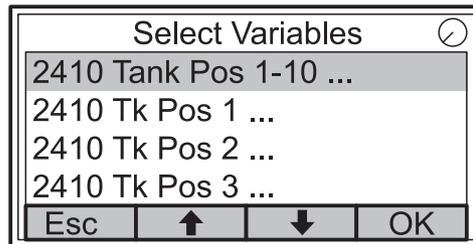
2. Use the up and down arrow softkeys to navigate to the desired 2410 Tank Position item.
3. Press the <OK> softkey to continue to the Selected Variables list.

Figure 4-14. The Select Variables Custom option

4. In the Select Variables list, choose the variables you wish to show in View Mode.
5. When finished, press <OK> to return to View Mode.

Table 4-1. Selectable variables

Variable	Description
Level	Product level in the displayed tank.
Ullage	Ullage is the distance from the Tank Reference Point to the product surface.
Level Rate	How the product in the tank moves when emptying or filling the tank.
Signal Strength	The signal strength of the radar level gauge.
Free Water Level	The level of water in the bottom of the tank. Available when a water level sensor is connected to the tank.
Vapor Pressure	Measured vapor pressure.
Liquid Pressure	Measured liquid pressure.
Air Pressure	Measured air pressure in the tank.
Ambient Temperature	Air temperature outside the tank.
Vapor Temperature	Temperature of vapor inside the tank.
Liquid Temperature	Temperature of the product in the tank.
Tank Temperature	Average temperature of the product in the tank
Temperature 1 To 16	Individual temperature of each selected temperature spot element.
Observed Density	Actual density of the product in the tank.
Reference Density	Reference density as specified with the configuration tool.
Flow rate	Measured flow rate.
Tot Obs Volume	Total observed product volume in the tank.
User defined 1 t o5	Custom measurement variable.
Middle Pressure	Measured pressure from transmitter P2.
Tank Height	Tank Reference Height
ΔLevel	Difference between two product levels.

Select Variables in TankMaster WinSetup

Variables to present in the View Mode can also be configured by using the TankMaster WinSetup configuration program. For more information see the Raptor System Configuration Manual (Document no.300510EN).

4.6.2 Select Tanks

In the Select Tanks menu, you can specify which tanks to show in View Mode. The following items are available:

- **Default**
- **All** which displays all available tanks in View Mode
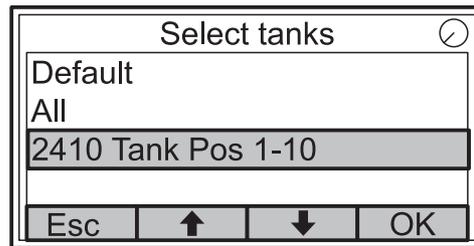- **2410 Tank Pos 1-10** which lets you choose the tanks to present in View Mode

2410 Tank Position 1-10

The *2410 Tank Pos 1-10* menu lets you select which tanks to present in View Mode. Up to ten tanks can be displayed. Note that the tanks need to be configured in the tank database of the Rosemount 2410 Tank Hub[1].

To select tanks:

1. In View Mode, press <Menu> <Options> <Select Tanks>:

Figure 4-15. The Select Tanks menu

```
┌─────────────────────────────────┐
│      Select tanks        ⊘       │
├─────────────────────────────────┤
│ Default                         │
│ All                             │
│ 2410 Tank Pos 1-10              │
│                                 │
├──────┬──────┬──────┬────────────┤
│ Esc  │  ↑   │  ↓   │    OK      │
└──────┴──────┴──────┴────────────┘
```

2. Use the up and down arrow softkeys to navigate to the **2410 Tank Pos 1-10** menu item.
3. Press the <OK> softkey to continue to the list of tanks:

Figure 4-16. The Select Tanks Custom option

```
┌─────────────────────────────────┐
│      Select Tanks        ⊖       │
├─────────────────────────────────┤
│ ☑ 01 Tank_1                     │
│ ☑ 02 Tank_2                     │
│ ☑ 03 Tank_3                     │
│ ☐ 04 Tank_4                     │
├──────┬──────┬──────┬────────────┤
│OnIOff│  ↑   │  ↓   │    OK      │
└──────┴──────┴──────┴────────────┘
```
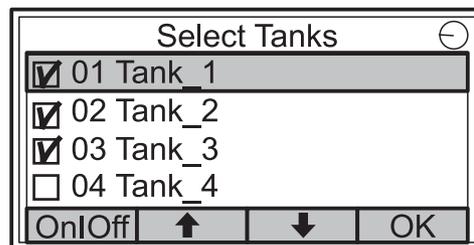
4. Use the up and down arrow softkeys to navigate to the desired tank.
5. Press the <On/Off> softkey to select the tank.
6. When finished, press the <OK> softkey to return to View Mode.

(1) *See the Rosemount 2410 Tank Hub Reference Manual (Document no. 300530en)*
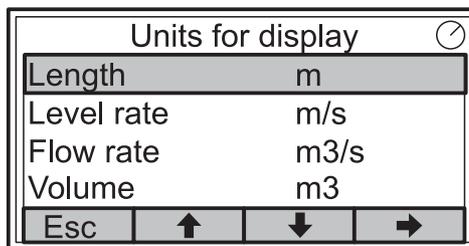
4.6.3   Units for Display

In the Units for Display menu, you can see which measurement units that are used for the displayed variables. The available measurement units are listed in Table 4-2 on page 4-12.
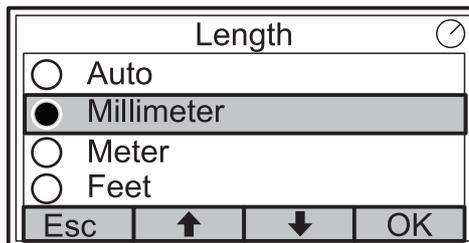
To change measurement unit:

1. In View Mode, press <Menu> <Options> <Units for Display>:

Figure 4-17. The Units for Display menu

```
┌────────────────────────────────┐
│     Units for display      ⊘   │
│ ┌────────────────────────────┐ │
│ │Length            m         │ │
│ ├────────────────────────────┤ │
│ │Level rate        m/s       │ │
│ │Flow rate         m3/s      │ │
│ │Volume            m3        │ │
│ └────────────────────────────┘ │
│  Esc   │   ↑   │   ↓   │   ➡   │
└────────────────────────────────┘
```

2. Use the up and down arrow softkeys to navigate to the desired variable menu item. In the example above, the Length variable was chosen.

3. Press the ➡ softkey to continue to the list of options for the selected variable.

Figure 4-18. Select unit for Length

```
┌────────────────────────────────┐
│        Length              ⊘   │
│ ┌────────────────────────────┐ │
│ │ ○  Auto                    │ │
│ ├────────────────────────────┤ │
│ │ ●  Millimeter              │ │
│ ├────────────────────────────┤ │
│ │ ○  Meter                   │ │
│ │ ○  Feet                    │ │
│ └────────────────────────────┘ │
│  Esc   │   ↑   │   ↓   │  OK   │
└────────────────────────────────┘
```

4. Use the up and down arrow softkeys to navigate to the desired measurement unit.

5. Press the <OK> softkey to select the unit and return to the Units for Display list.

See Table 4-2 for a list of available measurement units.

Table 4-2. Available
measurement units for the
Rosemount 2230

Variable	Available Measurement Units
Length	The following units are available for Level and Ullage: • Millimeter • Meter • Feet • Imperial 1/16
Level rate	The following units are available for Level rate: • Meter/second • Meter/hour • Feet/second • Feet/hour
Flow rate	The following units are available for Flow rate: • Cubic meter/hour • Barrel/hour • US gallon/hour • UK gallon/hour • Liter/minute
Volume	The following units are available for Volume: • Cubic meter • Barrel • US gallon • UK gallon • Liter
Temperature	The following units are available for Temperature: • Degrees Celsius • Degrees Fahrenheit • Kelvin
Pressure	The following units are available for Pressure: • Bar • Pascal • Kilo pascal • Atmosphere • PSI • Bar Absolute • Bar Gauge • PSI Absolute • PSI Gauge
Density	The following units are available for Density: • Kilogram/Cubic m • Kilogram/Liter • Degrees API
Voltage	Millivolt

4.6.4 Toggle Time

The Toggle Time parameter specifies the time period that each value, or set of values, is presented on the display.

To set the Toggle Time:

1. From View Mode, press <Menu> <Options> <Toggle Time>:

Figure 4-19. Set Toggle time

```
┌─────────────────────────────┐
│   Set Toggle Time      🚫    │
│     Toggle Time, s          │
│                             │
│          3                  │
│                             │
│  Esc  │  ↑  │  ↓  │  OK    │
└─────────────────────────────┘
```
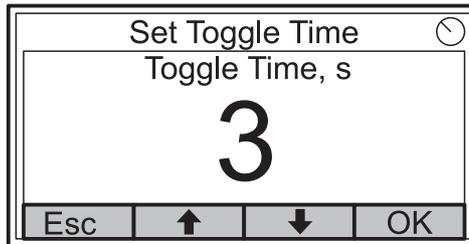
2. Use the up and down arrow softkeys to increase or decrease the Toggle Time.
3. Press the <OK>softkey to select the desired value and return to View Mode.

4.6.5 Language

To set the display Language:

1. Use the up and down arrow softkeys and navigate to the preferred language option:

Figure 4-20. Set display language

```
┌─────────────────────────────┐
│   Select Language      ⊘    │
│  English                    │
│  Spanish                    │
│  French                     │
│  Italian                    │
│  Esc  │  ↑  │  ↓  │  OK    │
└─────────────────────────────┘
```
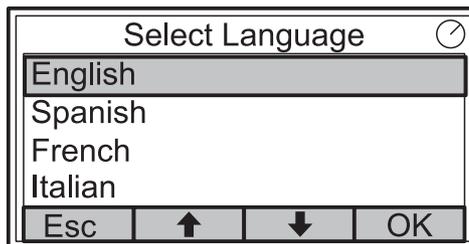
2. Press the <OK> softkey to select the language and return to View Mode.

4.7 THE SERVICE MENU

In the Service Menu, the following items are available:

- Status
- Custody Transfer View
- LCD Test
- LCD Contrast
- Restart
- Factory Settings
- About

To choose a Service menu item:

1. In View Mode, press the <Menu> button to open the Main menu:

Figure 4-21. Service option in the Main menu
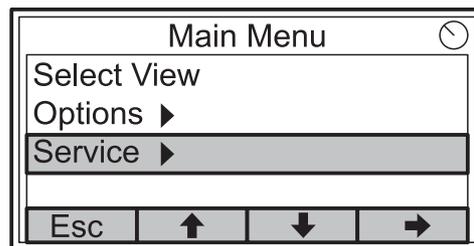
2. Use the ⬆ and ⬇ softkeys to navigate to the **Service** option.
3. Press the ➡ softkey.

Figure 4-22. The Service menu
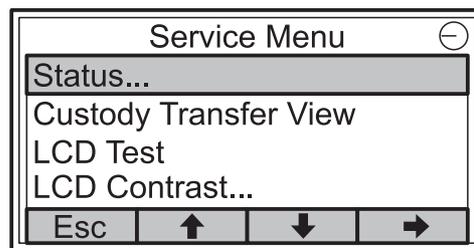
4. Use the up and down arrow softkeys to navigate to the desired menu item.
5. Press the ➡ softkey to continue to the selected menu.

4.7.1 Status

The Status screen shows the current status of the 2230. Various error messages and warnings can be displayed in case of software or hardware malfunctions. See "Troubleshooting" on page 5-7 for more information.

To view the current status information:

1. In the View Mode, press <Menu> <Service> <Status>:

Figure 4-23. Rosemount 2230 status

```
┌─────────────────────────────┐
│      Status...         ⊘     │
│ ▓Network: OK▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓ │
│  Hardware: GOOD             │
│  Write Protect: Off         │
│  Internal Temp: 25.3 °C     │
│ ┌──────┬─────┬─────┬──────┐ │
│ │ Esc  │  ↑  │  ↓  │      │ │
│ └──────┴─────┴─────┴──────┘ │
└─────────────────────────────┘
```
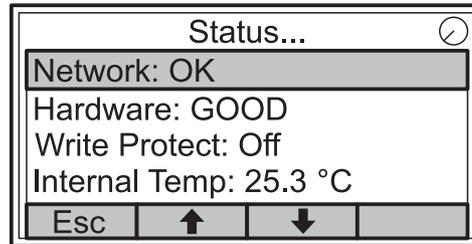
2. Press <Esc> to return to the Service menu.

See "Status Information" on page 5-2 for information on various status messages.

4.7.2 Custody Transfer View

The Custody Transfer view presents Level and Liquid Temperature for each tank.

To open the Custody Transfer view:

1. In View Mode, press <Menu> <Service> <Custody Transfer>:

Figure 4-24. Custody Transfer view

```
┌─────────────────────────────┐
│       Tank 9           ⊘     │
│   Level                     │
│   8161.0 mm                 │
│   Liquid temperature        │
│   26.86 °C                  │
│ ┌──────┬───────┬─────┬────┐ │
│ │ Esc  │ Pause │  ↓  │    │ │
│ └──────┴───────┴─────┴────┘ │
└─────────────────────────────┘
```
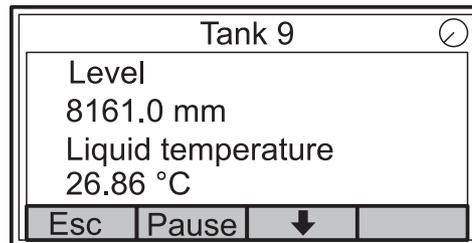
2. Press the <Esc> softkey to return to View Mode.
3. Press the <Pause> softkey to pause the display toggling.
4. Press the down arrow ↓ softkey to display the next tank.

4.7.3   LCD Test

In the LCD test two checkered patterns will be displayed testing the whole display area.

To open the LCD Test view:

1. In View Mode, press <Menu><Service><LCD Test>:

Figure 4-25. LCD test
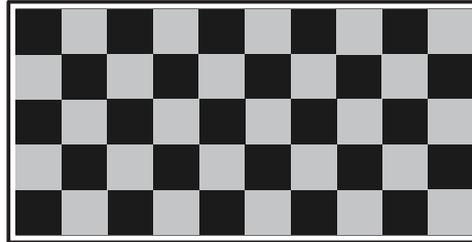
2. After the test is completed, the display will return to normal View Mode.

4.7.4   LCD Contrast

To adjust the LCD contrast:

1. In View Mode, press <Menu><Service><LCD Contrast>:
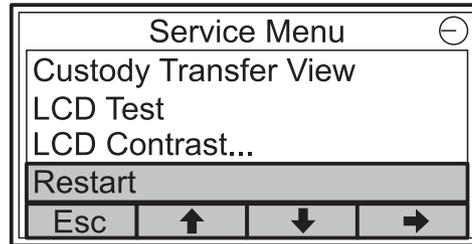
Figure 4-26. The LCD Contrast option
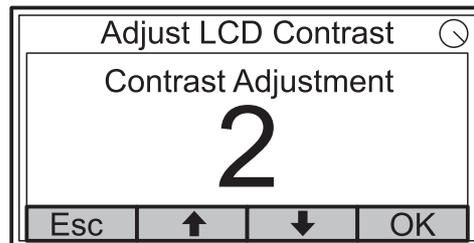
2. Use the up and down arrow softkeys to increase or decrease the LCD contrast.
3. Press the <OK>softkey to select the desired value and return to View Mode

4.7.5 Restart

To restart the 2230:

1. In View Mode, press <Menu><Service>:

Figure 4-27. The Restart option

```
┌─────────────────────────────────┐
│      Service Menu          ⊖     │
│ ┌─────────────────────────────┐  │
│ │ Custody Transfer View       │  │
│ │ LCD Test                    │  │
│ │ LCD Contrast...             │  │
│ │ Restart                     │  │
│ ├──────┬──────┬──────┬──────┤  │
│ │ Esc  │  ↑   │  ↓   │  ➡   │  │
│ └─────────────────────────────┘  │
└─────────────────────────────────┘
```

2. Choose the Restart option and press the ➡ softkey.
   The Restart option will connect the *Rosemount 2230* Graphical Field Display to the *Rosemount 2410* Tank Hub and perform start-up tests of software and hardware.

4.7.6 Factory Settings

To restore the 2230 to factory settings:

1. In View Mode, press <Menu><Service>:

Figure 4-28. The Restart option

```
┌─────────────────────────────────┐
│      Service Menu          ⊖     │
│ ┌─────────────────────────────┐  │
│ │ LCD Test                    │  │
│ │ LCD Contrast...             │  │
│ │ Restart                     │  │
│ │ Factory Settings...         │  │
│ ├──────┬──────┬──────┬──────┤  │
│ │ Esc  │  ↑   │  ↓   │  ➡   │  │
│ └─────────────────────────────┘  │
└─────────────────────────────────┘
```
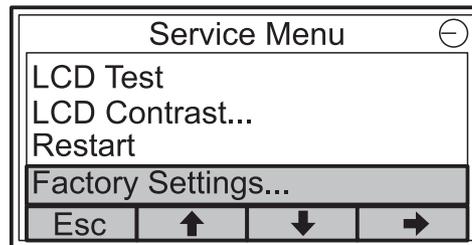
2. Choose the Factory Settings option and press the ➡ softkey.

Figure 4-29. Factory Settings

```
┌─────────────────────────────────┐
│     Factory Settings...     ◌    │
│ ┌─────────────────────────────┐  │
│ │ Reset to factory settings   │  │
│ │ overwrites configuration    │  │
│ │ parameters. Are you sure?   │  │
│ │ Press Esc to cancel.        │  │
│ ├──────┬──────┬──────┬──────┤  │
│ │ Esc  │      │      │  OK  │  │
│ └─────────────────────────────┘  │
└─────────────────────────────────┘
```
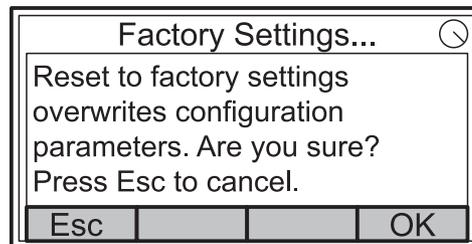
3. Press the <OK> softkey to restore the 2230 to factory settings, or press the <Esc> softkey to cancel.

4. When the *Rosemount 2230* is restored to factory settings, all user configuration will be lost.

4.7.7   **About**

To view the About information:

1. In View Mode, press <Menu><Service>.

2. Choose the About option and press the ➡ softkey.

Figure 4-30. Software revisions
for Rosemount 2230
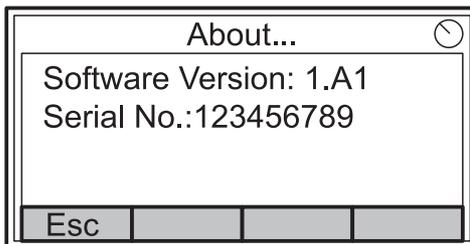
3. The About option will present the current software version and the 2230 serial number.

4. Press the <Esc> softkey to return to the Service menu.

Section 5 Service and Troubleshooting

5.1 SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

⚠WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the display is consistent with the appropriate hazardous locations certifications.

Before connecting a FF-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

5.2 SERVICE

5.2.1 Status Information

The Status screen lets you view the current status of the *Rosemount 2230*. To open the status information screen:

1. In the View Mode, press <Menu> <Service> <Status>:

Figure 5-1. Rosemount 2230 status
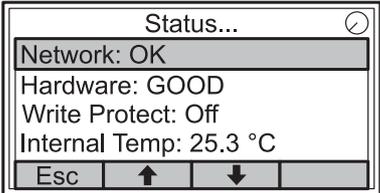
2. Use the ⬆ and ⬇ softkeys to view the various status messages.
3. Press <Esc> to return to the Service menu.

Various Status messages that appear on the 2230 display are listed in Table 5-1:

Table 5-1. Status Information

Status Message
Network
Hardware
Write Protect
Internal Temperature
Maximum Temperature
Minimum Temperature
Operation time
Last restart

5.2.2   Viewing Input and Holding Registers

Measured data is continuously stored in the *Rosemount 2230* **Input Registers.** They can be used for verifying that the Rosemount 2230 works properly and for advanced troubleshooting.

The **Holding Registers** store various configuration parameters which are used to control the display presentation.

By using the TankMaster WinSetup configuration tool most holding registers can be edited by simply typing a new value in the appropriate value input field.

To view Input and Holding registers for the 2230 display, do the following:

1. Start the TankMaster WinSetup program
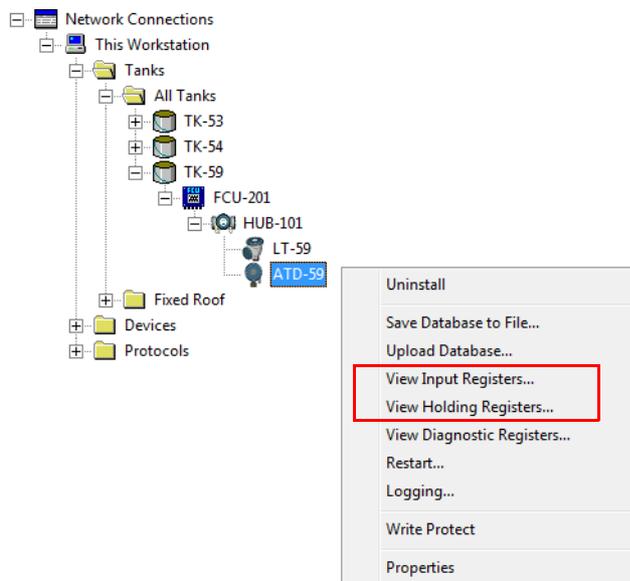
2. In the TankMaster WinSetup workspace window, click the right mouse button on the ATD device icon. The ATD device represents all the non-level devices such as the 2230 display.

3. Choose the View Input Registers (or View Holding Registers) option, or from the Service menu choose Devices > View Input / View Holding Registers.
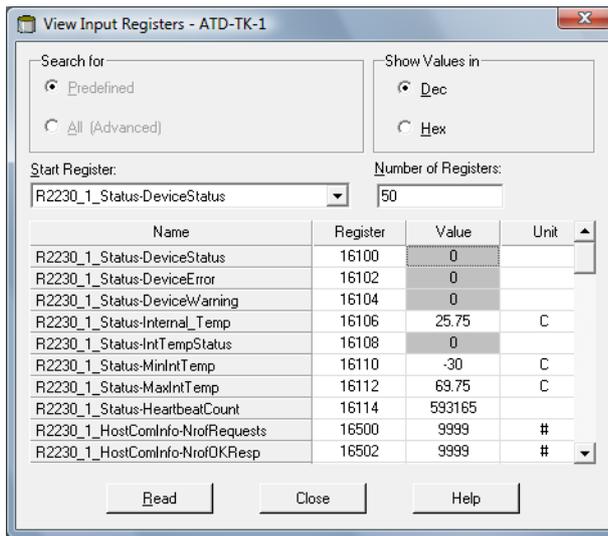
4. The **Predefined** option lists a basic selection of useful registers.

5. Choose the desired **Start Register** and enter the **Number of Registers** to read.

6. Click the **Read** button to update the Value column with the current register values.

5.2.3 Restarting the 2230 Display

To restart the Rosemount 2230 choose one of the following options:

- choose the Restart option in the Service menu, see "Restart" on page 4-17
- press the Reset button inside the display cover, see Figure 5-2
- use the Restart command in TankMaster WinSetup (Right click>Restart)

The Restart option will connect the *Rosemount 2230* Graphical Field Display to the *Rosemount 2410* Tank Hub and perform start-up tests of software and hardware.

Figure 5-2. Reset button
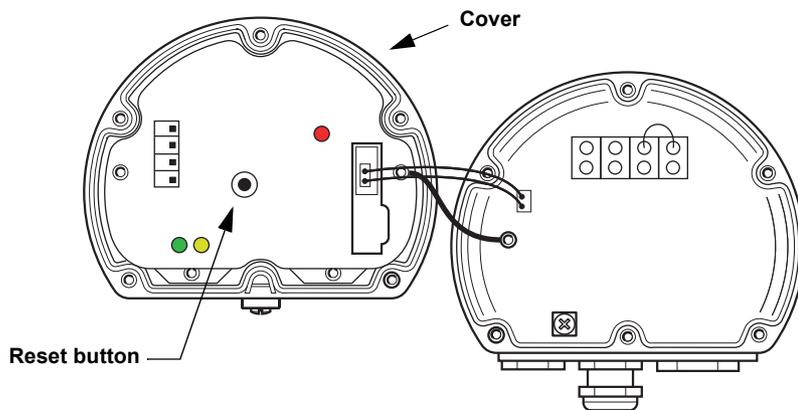
NOTE!
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. Cables must be properly attached to the cable glands.

5.2.4 Device Error Signals

A Light Emitting Diode (LED) inside the 2230 cover is used for presentation of device status using different blinking sequences.

Figure 5-3. Error signals
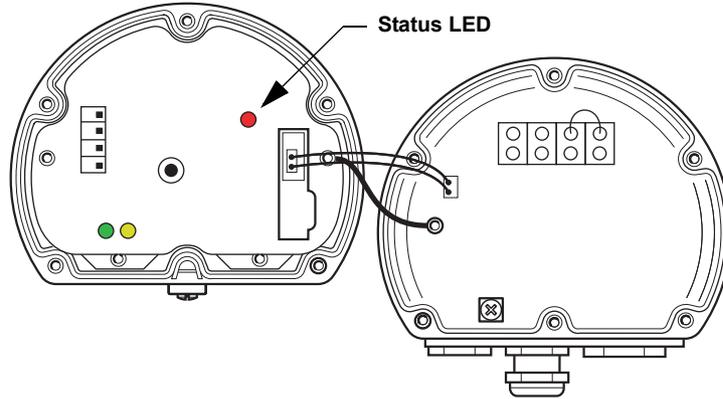
In normal operation the LED flashes once every other second. When an error occurs, a sequence of LED flashes presents a code number followed by a four second pause. The flash sequence is continuously repeated.

The following error codes can be presented by the LED:

Table 5-2. Status LED error codes

LED Status Code	Error Type
0	RAM error
1	FPROM error
2	HREG error
3	SW error
4	Other memory error
9	Internal temperature error
11	Measurement error

See "Device Errors" on page 5-9 for more information about the different error messages.

Example

Error code 3 is displayed as the following flash sequence:
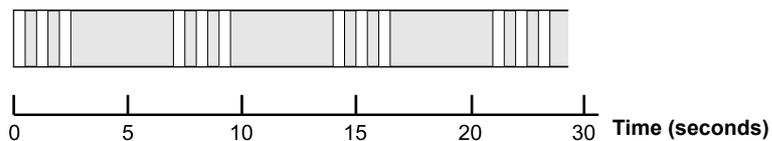
NOTE!
Only the first detected error is indicated.

NOTE!
Ensure that o-rings and seats are in good condition prior to mounting the cover in order to maintain the specified level of ingress protection. Cables must be properly attached to the cable glands.

5.3 TROUBLESHOOTING

Table 5-3 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

Table 5-3. Troubleshooting chart for the 2230 display

Symptom	Possible cause	Action
No communication with the Rosemount 2230	Wiring	• Check that wires are properly connected to the terminals • Check for dirty or defective terminals • Check wire insulation for possible short circuits to ground • Check that there are no multiple shield grounding points • Check that the cable shield is grounded at the power supply end (2410 Tank Hub) only • Check that the cable shield is continuous throughout the Tankbus network • Check that the shield inside the instrument housing does not come into contact with the housing • Check that there is no water in conduits • Use shielded twisted pair wiring • Connect wiring with drip loops • Check the 2410 Tank Hub wiring
	Incorrect Tankbus termination	• Check that there are two terminators on the Tankbus. Normally the built-in termination in the 2410 Tank Hub is enabled. • Check that terminations are placed at both ends of the Tankbus
	Too many devices on the Tankbus	• Check that the total current consumption of the devices on the Tankbus is less than 250 mA. See the *Rosemount 2410 Reference Manual* (Document no. 305030en) for more information. • Remove one or more devices from the Tankbus. The 2410 Tank Hub supports a single tank. The multiple tank version of the 2410 supports up to 10 tanks.
	Cables are too long	• Check that the input voltage on the device terminals is 9 V or more
	Hardware failure	• Check the 2230 • Check the 2160 Field Communication unit (FCU) • Check the Field Bus Modem • Check the communication port on the control room PC • Contact Emerson Process Management/Rosemount TankGauging service department
	Software failure	• Restart the 2230. Use for example the Restart command in TankMaster WinSetup. • Restart all devices by disconnecting and connecting the power supply to the 2410 Tank Hub • Contact Emerson Process Management/Rosemount TankGauging service department
	Field Bus Modem (FBM)	• Check that the FBM is connected to the right port on the control room PC • Check that the FBM is connected to the right port on the 2160 Field Communication Unit (FCU)
	Connection to 2160 FCU	• Check that the right field bus port on the 2160 FCU is connected to the Primary bus on the 2410 Tank Hub • Check communication port LED:s inside the Field Communication Unit 2160 (FCU)

Symptom	Possible cause	Action
	Incorrect configuration of 2160 Field Communication Unit (FCU)	• Check the Modbus communication address specified for the ATD device that represents the 2230 display in the 2160 FCU Slave Database. For the single tank version, the ATD address is equal to the Modbus address of the 2410 Tank Hub itself. • Check configuration of communication parameters for the FCU Fieldbus ports • Check that the correct communication channel is selected • See the *Raptor System Configuration Manual* (Document no. 300510EN) for more information on how to configure the 2160 FCU
	Incorrect configuration of tank database in 2410 Tank Hub	• Check the 2410 tank database; ensure that the 2230 device is available and mapped to the right tank • 2410 Tank Database; check that the *ATD Modbus* address is equal to the *2410 Temp* Modbus address in the FCU Slave Database • See the *Raptor System Configuration Manual* (Document no. 300510EN) for more information on how to configure the 2410 tank database
	Connection to 2410 Tank Hub	• Check wiring to the 2410 Tank Hub • Check the 2410 Tank Hub; check the Error LED or the integral display for information
	Configuration of communication protocol	In TankMaster WinSetup: • open the Protocols folder and check that the protocol channel is enabled • check the protocol channel configuration (right-click the protocol channel MbMaster icon, choose the Properties option, and check port, parameters, modem)
The Status LED is blinking error codes	• Hardware errors • Software errors	• See "Device Error Signals" on page 5-6 • Check Device Status information. See "Status Information" on page 5-2 and "Viewing Input and Holding Registers" on page 5-3) • See "Device Errors" on page 5-9
Configuration can not be saved	Write protection switch is set to the ON position	Check write protection switch on the 2230.
Invalid measurement data (--.---)	Device failure	Check the devices connected to the Tankbus for possible hardware or software failure
Warning symbol appears in front of measurement value	Simulation mode active	Stop simulation mode in WinSetup (open WinSetup *Set Simulation Mode* window and click the Stop button)
Activity indicator shows a warning symbol	Communication failure	Check that the 2230 is configured in the 2410 tank database. See the *Raptor System Configuration Manual* (Document no. 300510EN) for more information on how to configure the 2410 tank database.
Nothing appears on the LCD display	• No power supply • FISCO fuse broken • Contrast settings	Check status LED (see "Device Error Signals" on page 5-6). If Status LED does not light: • check power on Tankbus wiring • check FISCO fuse If Status LED lights: • check contrast settings of the LCD display

5.3.1 Device Errors

Table 5-4 shows a list of error messages for the *Rosemount 2230*. Detailed information about the different error types can be found in Input registers 1100 - 1134 as shown in Table 5-4.

Table 5-4. Device Errors

Message	Description	Action
RAM Error	Input register no. 1100[1]. The following bits indicate a serious RAM problem. Bit 0: RAM	Contact Emerson Process Management/Rosemount TankGauging service department.
FPROM Error	Input register no. 1102. The following bits indicate a serious FPROM problem or wrong software versions loaded. Bit 0: Checksum Error Bit 4: Boot Checksum Bit 5: Boot Version (Invalid version number) Bit 6: Application Checksum Bit 7: Application Version (Invalid version number)	
Hreg Error	Input register no. 1104. The following bits indicate a serious Holding register problem. NOTE: the Holding register default values are used in case of an error. Bit 0: Checksum Error Bit 1: Limit Error. One or more Holding register is out of range. Bit 2: Version Error. Invalid SW version detected. Bit 3: HREG Read Error. Bit 4: HREG Write Error. Failed to program a cell in the EEPROM.	
SW Error	Input register no. 1106. Bit 0: Undefined SW error. Bit 1: Task not running Bit 2: Out of stack space Bit 3: Unused RAM access. Bit 4: Divide by zero error Bit 5: Reset counter overflow Bit 15: Simulated SW error	
Other Memory Error	Input register no. 1108. Bit 0: NVRAM_Access	
Display Error	Input register no. 1112.	Not used
Modem Error	Input register no. 1114.	Not used
Internal Temperature Error	Input register no. 1118. Bit 0: Internal temperature out of range Bit 1: Communication error with temp chip Bit 2: Device error	Contact Emerson Process Management/Rosemount TankGauging service department.
Measurement Error	Input register no. 1122.	Not used

Message	Description	Action
Configuration Error	Input register no. 1124. Bit 1: Unit Not Supported	Choose a supported measurement unit
numHiddenErrors	Input register no. 1132. Number of hidden errors.	Contact Emerson Process Management/Rosemount TankGauging service department.
numOtherErrors	Input register no. 1134. Number of other errors.	

(1) The register number refers to the internal Input Register of the 2230 database.
Note that Input Register data from the 2230 display is temporarily stored in the Input Register database of the 2410 Tank Hub. The Input Registers presented in TankMaster WinSetup refer to the internal register area of the 2410. Therefore, for tank 1 you will have to add 16000 to the 2230 internal register number as given by Table 5-4 in order to find the register presented by WinSetup. For the second and third 2230 display you will have to add 18000 and 20000, respectively.

5.3.2 Device Warnings

Device warnings are signaled in the Input Register *Device Warnings.* Warnings are less serious than errors. Detailed information about the different warning types can be found in Input registers 1050 - 1070.

Table 5-5. Device warnings

Message	Description	Action
RAM warning	Input register no. 1050[1]. The application software could not be started. Bit 0: Stack low	Contact Emerson Process Management/Rosemount TankGauging service department.
FPROM warning	Input register no. 1052	Not used
Hreg warning	Input register no. 1054. Bit 0: Default Holding register values used	Contact Emerson Process Management/Rosemount TankGauging service department.
Other memory warning	Input register no. 1056	Not used
Display warning	Input register no. 1058	Not used
Modem warning	Input register no. 1060	Not used
Other hardware warning	Input register no. 1062	Not used
Measurement warning	Input register no. 1064	Not used
ITEMP warning	Input register no. 1066. Bit 0: The internal temperature is out of range	Contact Emerson Process Management/Rosemount TankGauging service department.
Software warning	Input register no. 1068. Bit 1: Stack low (less then 10% left of stack) Bit 2: Software startup	
Configuration warning	Input register no. 1070 Bit 11: Invalid Model Code String Bit 12: Invalid Model Code	

(1) The register number refers to the internal Input Register of the 2230 database. The Input Registers presented in TankMaster WinSetup refer to the internal register area of the 2410. For tank 1 add 16000 to the 2230 internal register number as given by Table 5-5 in order to find the register presented by WinSetup. For the second and third 2230 display you will have to add 18000 and 20000, respectively.

Reference Manual
300560EN, Rev AA
May 2011

Rosemount 2230

5.3.3 Status Information

Status information is available for each measurement variable via the Status button in the View menu.

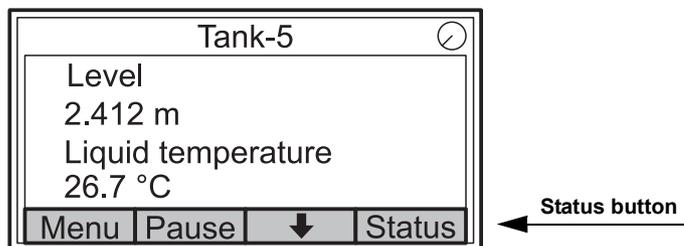Table 5-6. Status Information

Status	Description	Action
Invalid_TV_Value	Invalid source value.	
InvalidSourceConfig	The source value (Tank Variable) is invalid due to one of the following reasons: • Incorrect configuration • Out of service in FF • Incorrect configuration of measurement units	
DataFrozen	Tank measurement variable not updated for a configurable time or the source data is frozen.	
Saturated Low	Tank measurement variables is outside lower range or saturated.	
Saturated High	Tank measurement variables is outside upper range or saturated.	
Simulated	The tank measurement variable is simulated.	
Manual Value	The tank measurement variable value is manual (constant).	
Approved Value	The tank measurement variable value is inside approval range and the device is write protected.	
Invalid Value	The tank measurement variable value is invalid.	

Appendix A   Reference Data

A.1   SPECIFICATIONS

General	
Product	Rosemount 2230 Graphical Field Display
Toggle time	The time each value or set of values are shown on the display: 2-30 s
Language selection possibilities	English, French, German, Spanish, Italian, and Portuguese
Variables to display	Level, level rate, ullage, signal strength, volume (TOV), liquid average temperature, 1-16 spot temperature, vapor average temperature, ambient temperature, free water level, vapor pressure, liquid pressure, air pressure, observed density, and flow rate
Units to display	Level, free water level, and ullage: meter, millimeter, feet, or imperial 1/16 Level rate: meter/second, meter/hour, feet/second, or feet/hour Flow rate: meter^3/hour, liter/minute, feet^3/hour, barrel/hour, or US gallon/hour Total Observed Volume (TOV): meter^3, liters, feet^3, barrel, or US gallon Temperature: °F, °C, or °K. Pressure: psi, psiA, psiG, bar, barA, barG, atm, Pa, or kPa Density: kg/m^3, kg/liter, or °API Signal strength: mV
Hazardous location certifications and IS parameters	ATEX, FM-C, FM-US, and IECEx.
CE-mark	Complies with applicable EU directives (EMC, ATEX)
Ordinary location certification	Complies with FM 3810:2005 and CSA: C22.2 No. 1010.1
Electric	
Power supply	Powered by Rosemount 2410 Tank Hub (9.0-17.5 VDC, polarity insensitive)
IS parameters	See "Product Certifications" on page B-1
Bus current draw	30 mA
Display type	Back-lit LCD monochrome display. 128x64
Start-up time	5 s
Update rate	New values to display once every two seconds
Response time	< 0.5 s from released button to new image
Cable entry[1] (connection/glands)	Three entries, two M20×1.5 and one M25×1.5. Optional: • ½ - 14 NPT conduit / cable adapter • Metal cable glands (½ - 14 NPT) • 4-pin male Eurofast connector or A size Mini 4-pin male Minifast connector
Tankbus cabling	AWG 0.5-1.5 mm^2 (22-16), shielded twisted pairs
Built-in termination	Yes (to be connected if required)
Mechanical	
Housing material	Polyurethane-covered die-cast aluminum
Dimensions (width x height x depth)	150 x 120 x 78 mm (5.9 x 4.7 x 3.1 in.)
Weight	1.2 kg (2.6 lbs)

ROSEMOUNT®
Tank Gauging

EMERSON
Process Management

Environment	
Ambient temperature	-20 to 70 °C (-4 to 158 °F)
Storage temperature	-30 to 85 °C (-22 to 185 °F)
Humidity	0-100% relative humidity, non-condensing
Ingress protection	IP 66 and 67 (Nema 4)
Metrology sealing possibility	Yes
Write protect switch	Yes

(1) *Make sure that unused ports are properly sealed to prevent moisture or other contamination from entering the electronics housing. Use the enclosed metal plug for this purpose.*

A.2 DIMENSIONAL DRAWINGS

Figure A-1. Dimensional drawings
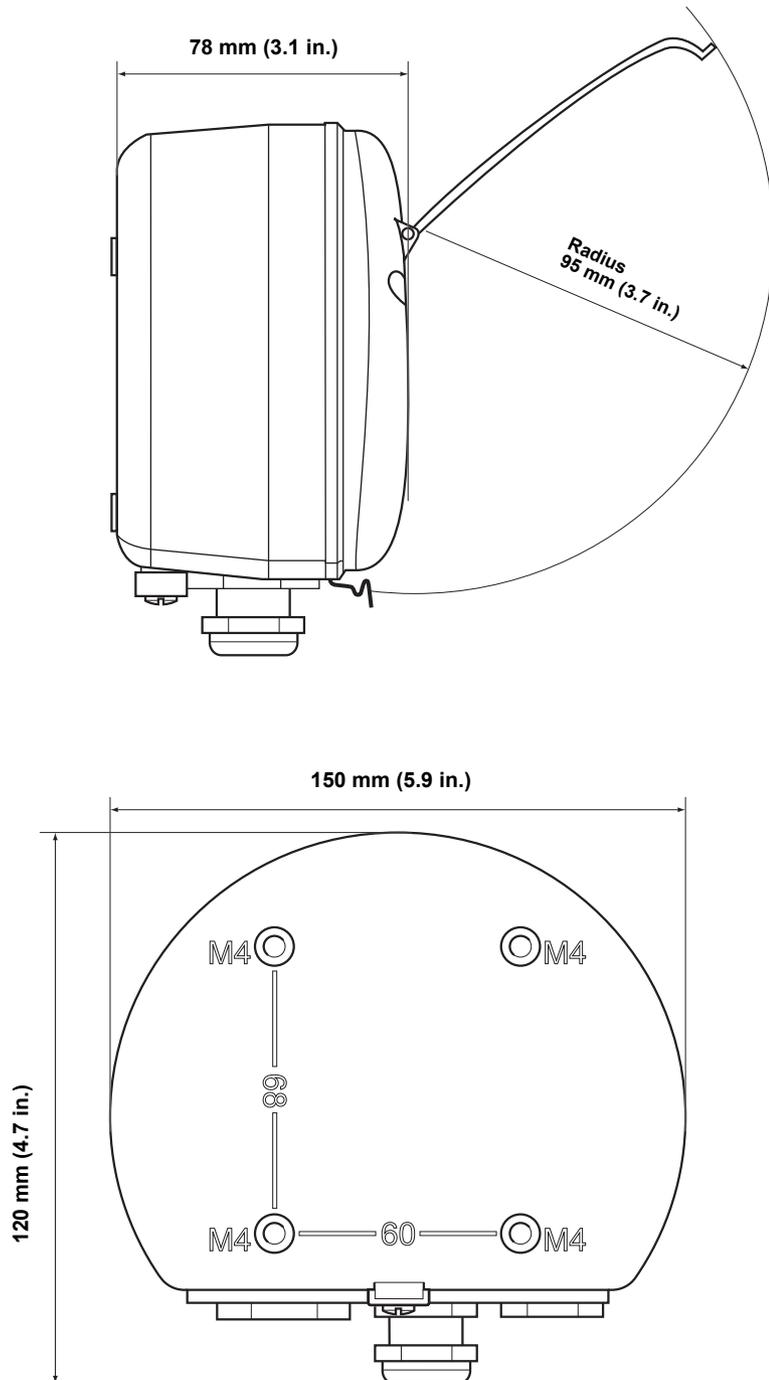
A.3 ORDERING INFORMATION

Model (Pos 1)	Product Description	Note
2230	Graphical Field Display	
Code (Pos 2)	**Default Language**	**Note**
E	English	Other languages are software selectable
Code (Pos 3)	**Tankbus: Power and Communication**	**Note**
F	Bus powered 2-wire FOUNDATION™ fieldbus (IEC 61158)	
Code (Pos 4)	**Software**	**Note**
S	Standard	
Code (Pos 5)	**Hazardous Location Certification**	**Note**
I1	ATEX Intrinsic Safety	
I5	FM-US Intrinsic Safety	
I6	FM-Canada Intrinsic Safety	
I7	IECEx Intrinsic Safety	
KA	ATEX Intrinsic Safety+FM-US Intrinsic Safety[1]	
KC	ATEX Intrinsic Safety+IECEx Intrinsic Safety[1]	
KD	FM-US Intrinsic Safety+FM-Canada Intrinsic Safety[1]	
NA	No Hazardous Location Certification	
Code (Pos 6)	**Custody Transfer Type Approval**	**Note**
R	OIML R85 E performance certification	
0	None	
Code (Pos 7)	**Housing**	**Note**
A	Standard enclosure	Polyurethane-covered aluminium. IP 66/67
Code (Pos 8)	**Cable/Conduit Connections**	**Note**
1	1/2–14 NPT and 3/4-14 NPT Adapters	Female thread. Includes 2 plugs and 3 adapters
2	M20 x 1.5 and M25 x 1.5	Female thread. Includes 2 plugs
G	Metal Cable Glands (M20 x 1.5 and M25 x 1.5)	Min. temperature -20˚C (-4˚F). ATEX / IECEx Exe approved. Includes 2 plugs
E	Eurofast Male, M20 x 1.5 and M25 x 1.5	3 plugs included
M	Minifast Male, M20 x 1.5 and M25 x 1.5	3 plugs included
Code (Pos 9)	**Mechanical Installation**	**Note**
W	Wall installation kit included	
Code	**Options – none or multiple selections are possible**	**Note**
ST	Engraved SST tag plate	Provide tag information in order
Model Code Example: 2230 - E F S I1 0 A 1 W - ST		

(1) *Not available with LPG/LNG antenna.*

Appendix B   Product Certifications

B.1 SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the transmitter is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.

⚠WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

Any substitution of non-recognized spare parts may jeopardize safety. Repair, for e.g. substitution of components etc. may also jeopardize safety and is under no circumstances allowed.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

> **⚠ WARNING**
>
> **High voltage that may be present on leads could cause electrical shock:**
>
> Avoid contact with leads and terminals.
>
> Make sure the mains power to the Radar Transmitter is off and the lines to any other external power source are disconnected or not powered while wiring the transmitter.
>
> Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

B.2 EU CONFORMITY

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount Tank Gauging web site at www.rosemount-tg.com. A hard copy may be obtained by contacting our local sales representative.

B.3 HAZARDOUS LOCATIONS CERTIFICATIONS

The Rosemount 2230 Graphical Field Displays that have the following labels attached have been certified to comply with the requirements of the approval agencies noted.

B.3.1 Factory Mutual US Approvals

Certificate of Compliance: 3037177

Figure B-1. Factory Mutual Intrinsic Safety US Approval Label

I5

FISCO Field Device (Fieldbus Terminals)

Intrinsically Safe for Class I, II, III Division 1, Groups A, B, C, D, E, F and G

Temperature Class T4, Ambient Temperature Limits: -50 °C to +70 °C

Class I Zone 0 AEx ia IIC T4 (-50 °C $\leq$ Ta $\leq$ +70 °C)

U_i=17.5V, I_i=380mA, P_i=5.32W, C_i=2.1nF, L_i=1.1µH

Entity (Fieldbus Terminals)

Intrinsically Safe for Class I, II, III Division 1, Groups A, B, C, D, E, F and G

Temperature Class T4, Ambient Temperature Limits: -50 °C to +70 °C

Class I Zone 0 AEx ia IIC T4 (-50 °C $\leq$ Ta $\leq$ +70 °C)

U_i=30V, I_i=300mA, P_i=1.3W, C_i=2.1nF, L_i=1.1µH

Install per Control Drawing 9240040-949

Special Conditions of Use

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Division 1 and Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.

2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.

3. The associated apparatus through which the equipment is supplied shall provide galvanic isolation between the input and output of the associated apparatus.

B.3.2 Factory Mutual Canadian Approvals

Certificate of Compliance: 3037177C.

Figure B-2. Factory Mutual Intrinsic Safety Canadian Approval Label

I6

FISCO Field Device (Fieldbus Terminals)

Intrinsically Safe for Class I, II, III Division 1, Groups A, B, C, D, E, F and G

Temperature Class T4, Ambient Temperature Limits: -50 °C to +70 °C

U_i=17.5V, I_i=380mA, P_i=5.32W, C_i=2.1nF, L_i=1.1µH

Entity (Fieldbus Terminals)

Intrinsically Safe for Class I, II, III Division 1, Groups A, B, C, D, E, F and G

Temperature Class T4, Ambient Temperature Limits: -50 °C to +70 °C

U_i=30V, I_i=300mA, P_i=1.3W, C_i=2.1nF, L_i=1.1µH

Install per Control Drawing 9240040-949

Special Conditions of Use

1. The associated apparatus through which the equipment is supplied shall provide galvanic isolation between the input and output of the associated apparatus.

B.3.3 European ATEX Directive Information

The Rosemount 2230 Graphical Field Displays that have the following labels attached have been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19-April-1994.

Figure B-3. ATEX Intrinsic Safety Approval Label
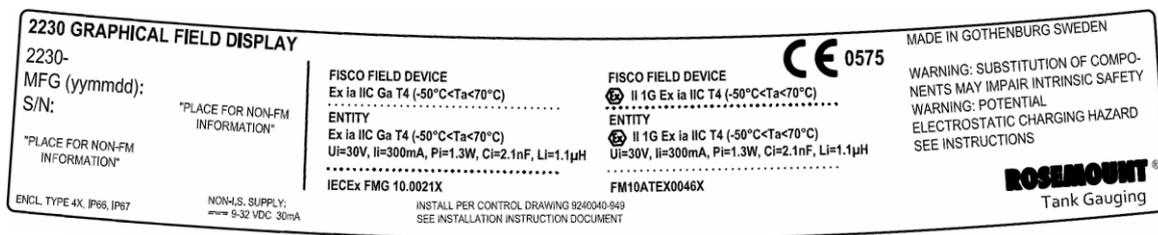
I1 The following information is provided as part of the label of the transmitter:

- Name and address of the manufacturer (Rosemount)
- CE Conformity Marking

$$\text{CE } 0575$$

- Model number
- Serial number of the device
- Year of construction
- ATEX EC-Type Examination Certificate Number FM10ATEX0046X
- Install per Control Drawing: 9240040-949

FISCO Field Device (Fieldbus Terminals)

⟨Ex⟩ II 1 G

- Ex ia IIC T4 (-50 °C ≤ Ta ≤ +70 °C)
- Ui=17.5V, Ii=380mA, Pi=5.32W, Ci=2.1nF, Li=1.1µH

Entity (Fieldbus Terminals)

⟨Ex⟩ II 1 G

- Ex ia IIC T4 (-50 °C ≤ Ta ≤ +70 °C)
- Ui=30V, Ii=300mA, Pi=1.3W, Ci=2.1nF, Li=1.1µH

Specific Conditions of Certification (X)

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.

2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.

3. The associated apparatus through which the equipment is supplied shall provide galvanic isolation between the input and output of the associated apparatus.

B.3.4 IECEx Approval

Figure B-4. IECEx Intrinsic
Safety Approval Label
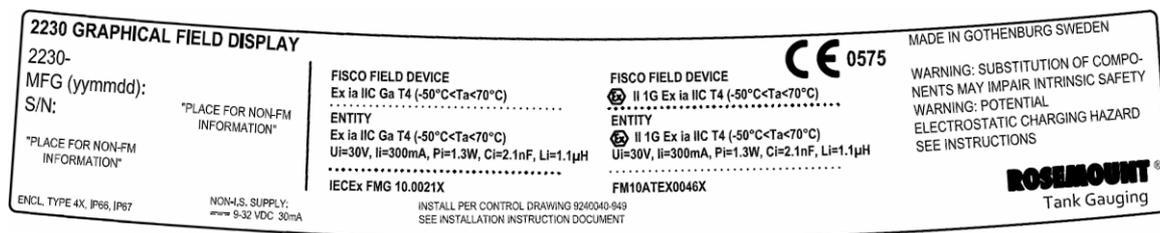
I7 The following information is provided as part of the label of the transmitter:

- Name and address of the manufacturer (Rosemount)
- Model number
- Serial number of the device
- IECEx Certificate of Conformity Number IECEx FMG 10.0021X
- Install per Control Drawing: 9240040-949

FISCO Field Device (Fieldbus Terminals)

- Ex ia IIC Ga T4 (-50 °C $\leq$ Ta $\leq$ +70 °C)
- Ui=17.5V, Ii=380mA, Pi=5.32W, Ci=2.1nF, Li=1.1μH

Entity (Fieldbus Terminals)

- Ex ia IIC Ga T4 (-50 °C $\leq$ Ta $\leq$ +70 °C)
- Ui=30V, Ii=300mA, Pi=1.3W, Ci=2.1nF, Li=1.1μH

Specific Conditions of Certification (X)

1. The non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore particularly when it is used for applications that specifically require Group II, Zone 0 located equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment shall only be cleaned with a damp cloth.

2. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.

3. The associated apparatus through which the equipment is supplied shall provide galvanic isolation between the input and output of the associated apparatus.

B.4 APPROVAL DRAWINGS

Follow the installation guidelines presented in Factory Mutual system control drawings in order to maintain certified ratings for installed devices.

The following drawings are included in the documentation for the Rosemount 2230 Graphical Field Display:

9240040-949 System Control Drawing for hazardous location installation of intrinsically safe FM approved apparatus.

See the "Manuals & Drawings" CD ROM that is shipped with the 2230 Graphical Field Display for electronic copies of the system control drawings.

Drawings are also available on the Rosemount Tank Gauging web site: www.rosemount-tg.com.

Index

Emerson Process Management

Rosemount Tank Gauging
Box 130 45
SE-402 51 Göteborg
SWEDEN
Tel (International): +46 31 337 00 00
Fax (International): +46 31 25 30 22
E-mail: sales.rtg@emerson.com
www.rosemount-tg.com

EMERSON
Process Management